

NAVSHIPS 93202

Non-Registered

MANUSCRIPT-FORM
TECHNICAL MANUAL
for
ANTENNA TUNING GROUP
AN/SRA-20

International Electronics Engineering, Inc.
Washington 4, D. C.

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS

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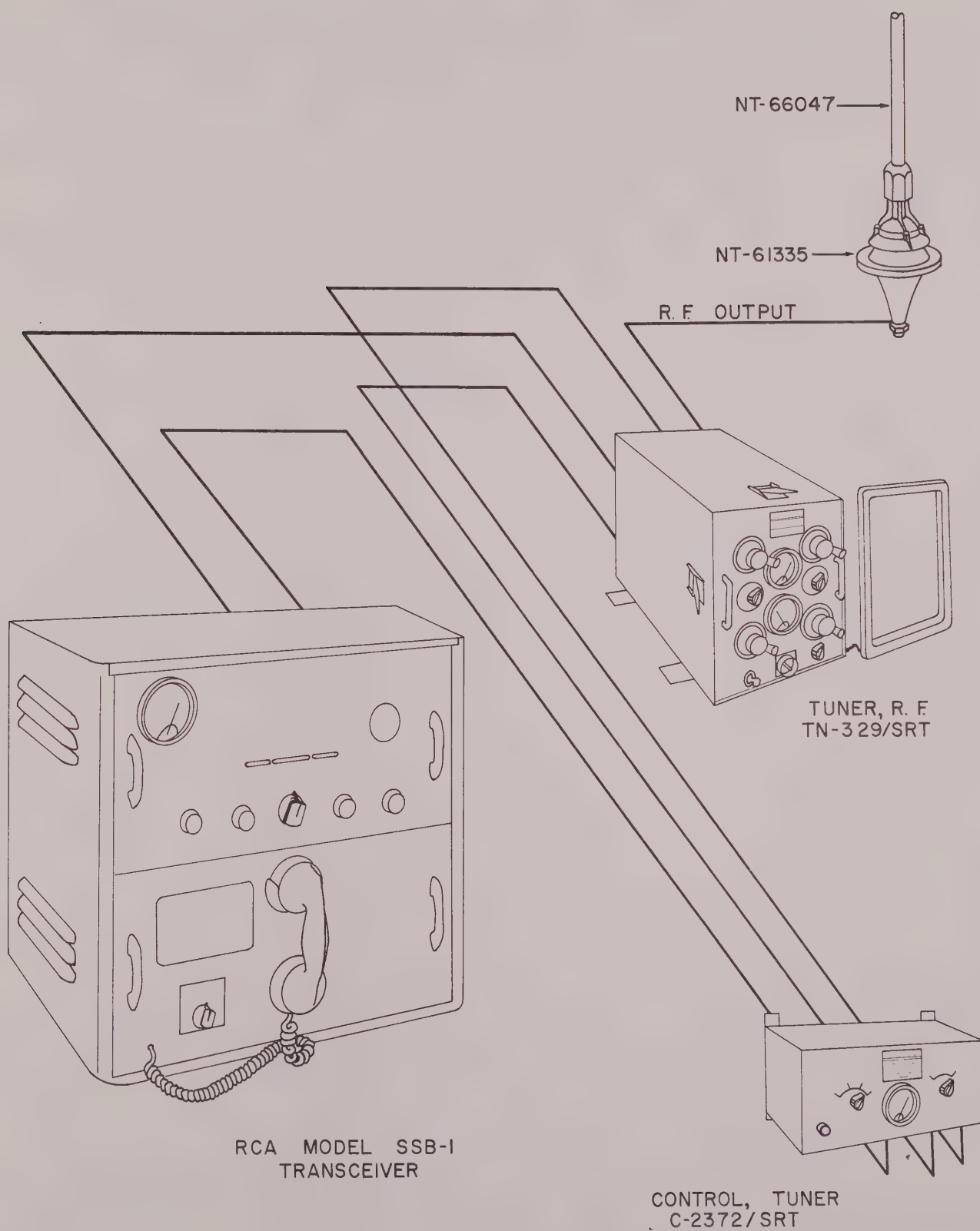
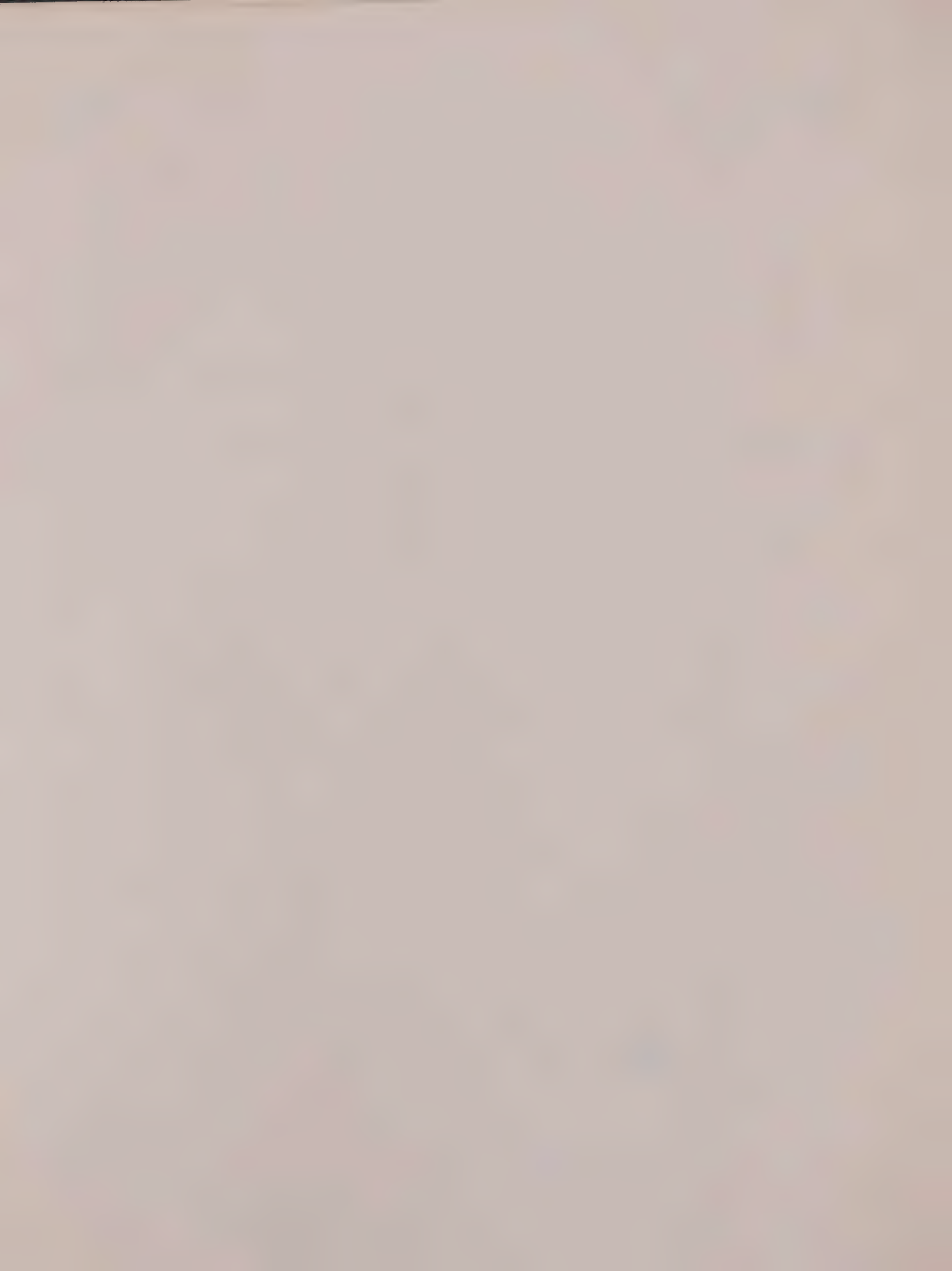


Figure I-1. Antenna Tuning Group AN/SRA-20, Units Supplied



SECTION 1
GENERAL INFORMATION

1-1. INTRODUCTION.

This technical manual describes the circuit theory, installation, operation, and maintenance of Antenna Tuning Group AN/SRA-20. The AN/SRA-20 consists of Control, Tuner C-2372/SRT; Tuner, RF TN-329/SRT; connectors, and a kit of parts for the associated transmitter control circuit and RF output modification.

1-2. DESCRIPTION.

Antenna Tuning Group AN/SRA-20 was procured specifically for use with Single Sideband Transceiver RCA Model SSB-1. However, it may be used with any transmitter having similar characteristics providing the transmitter is suitably modified. This equipment normally includes a field change kit for the SSB-1 Transceiver (Field Change 2-SSB-1), which modifies the SSB-1 for operation with Antenna Tuning Group AN/SRA-20. This field change must be accomplished on the SSB-1 before the two equipments may be operated together.

Antenna Tuning Group AN/SRA-20 (Figure 1-1) provides a means for tuning and matching a standard Navy 35-foot whip antenna, type 66047 or similar, to a 50-ohm transmission line over a frequency range of 2 to 15 mc, thereby allowing maximum transfer of power from the transmitter to the antenna. In addition, a 50-ohm, 100-watt dummy antenna load contained in the Control, Tuner C-2372/SRT, enables the transmitter RF output to be tuned into the dummy load locally and then switched directly to the Tuner, RF TN-329/SRT and antenna NT-66047. Antenna Tuning Group AN/SRA-20 is capable of continuous operation under RF power conditions up to 100 watts over the frequency range of 2 to 15 mc. Although Antenna Tuning Group AN/SRA-20 may be operated with any transmitter within these power and frequency ranges, the transmitter circuitry must be modified to permit compatible remote control capability. The field change kit supplied with the AN/SRA-20 is for use with single sidebands Transceiver SSB-1 and reference to Field Change Bulletin 2-SSB-1, NAVSHIPS 981008, must be made concerning applications of this kit.

a. TUNER, RF TN-329/SRT.—Tuner, RF TN-329/SRT, Figure 1-1, consists of a watertight case which encloses the RF, electrical, and mechanical portions of the unit.

The front panel is recessed to allow clearance of the tuning controls by the watertight cover. The perimeter of the cover mates with a rubber gasket and four clamp fasteners secure it tightly in place to provide a watertight seal. The RF input, output, and control circuitry connections are made at the rear panel. The unit's watertight integrity is maintained at the rear connectors by silicone sponge rubber gaskets.

b. CONTROL, TUNER C-2372/SRT.—Control, Tuner C-2372/SRT is contained in a rectangular cabinet fabricated from aluminum alloy and finished in standard navy gray enamel. Tabs are included on the four rear corners for mounting purposes. The front panel of this unit contains all the necessary controls

for remote operation of the antenna tuner (TN-329/SRT). A standing-wave ratio reflected power meter indicator is also mounted on the front panel. All connections to this unit are made on the bottom of the cabinet through standard connectors.

c. **PARTS KIT.**—The kit of parts supplied with Antenna Tuning Group AN/SRA-20 is for the purpose of accomplishing Field Change 2 to Single Sideband Transceiver RCA Model SSB-1. This field change permits compatible operation of the AN/SRA-20 and the SSB-1 Transceiver. For further information, consult Field Change Bulletin 2-SSB-1, NAVSHIPS 981008.

1-3. **FIELD CHANGES.**

No field changes have been made to this equipment.

1-4. **QUICK REFERENCE DATA.**

a. **NOMENCLATURE.**—Antenna Tuning Group AN/SRA-20.

CONSISTS OF: TUNER, RF TN-329/SRT

CONTROL, TUNER C-2372/SRT.

b. **CONTRACT AND DATE.**—NObsr-75194, 25 April 1958.

c. **CONTRACTOR.**—International Electronics Engineering, Inc., (Antran Division), Route 450, Greenwood Acres, Annapolis, Maryland.

d. **COGNIZANT NAVAL INSPECTOR.**—Inspector of Naval Material, 401 Water Street, Baltimore 2, Maryland.

e. **NUMBER OF PACKAGES FOR EACH COMPLETE EQUIPMENT.**—1.

f. **TOTAL WEIGHT FOR EACH COMPLETE EQUIPMENT.**—_____.

g. **MAXIMUM INSERTION LOSS.**—Less than 0.5 decibel.

h. **TRANSMISSION LINE CHARACTERISTIC IMPEDANCE.**—50 ohms.
(RG-10A/U.)

i. **POWER REQUIREMENTS.**—110-120 volts ac, 60 cycles, single phase, 100 watts. Power is consumed only when channels are being changed. A separate power source is not necessary when operating with the SSB-1 transceiver.

j. **MAXIMUM RF POWER INPUT.**—100 watts.

k. **OPERATING FREQUENCY RANGE.**—2 to 15 megacycles.

TABLE 1-1 ANTENNA TUNING GROUP AN/SRA-20, EQUIPMENT SUPPLIED

Qty Per Equip	Nomenclature		*Over-All Dimensions				
	Name of Unit	Designation	Length	Height	Width	Approx. Vol.	Wt.
1	Tuner, R.F.	TN-329/SRT	20	14	14 5/16	2.3	38.7
1	Control, Tuner	C-2372/SRT	13 11/16	7 3/4	5 15/16	.37	7.2
3	Connectors	AN3106A-18-12P					
2	Connectors	AN3106A-20-33P					
1	Connector	AN3106A-16-10P					
3	Connectors	UG-941A/U					
2	Technical Manuals	NAVSHIPS 93202					
1	**Field Change Kit	2-SSB-1	10	5 1/2	4	.16	

*Dimensions in inches, volume in cubic feet, weight in pounds.

** Required only when Antenna Tuning Group AN/SRA-20 is used with
Single Sideband Transceiver RCA Model SSB-1

TABLE 1-2 EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT FURNISHED

Qty Per Unit	Name of Unit	Navy Type Designation	Required Use	Required Characteristics
1	Radio Trans- mitter Ser or transceiver (and associated technical manual)	Various	To transmit communications	Power output 100 watts or less; frequency range 2 to 15 mega- cycles
1	35-ft. whip antenna	NT-66047	RF Radiator	
1	Antenna base insulator	NT-61335	To support whip antenna	
2	Sound-powered hand telephone assembly or chestset.		Local-communi- cation during channel pretun- ing.	
As req.	Cable	RG-10A/U	Transmission Line	Route cable in most direct manner
As req.	Cable	MSCA-7	To fabricate control cables	
As req.	Cable	MSCA-10	To fabricate control cables	

TABLE 1-3 ANTENNA TUNING GROUP AN/SRA-20, SHIPPING DATA

Box No.	Nomenclature Name	*Over-All Dimensions			Volume	Weight
		Length	Height	Width		
1	TN-329/SRT	22	16	14	2.85	
2	C-2372/SRT	15 1/2	7 1/2	9 1/2	.64	
3	Kit of connectors	13	3 1/2	3 1/2	.09	
4	Field Change Kit	10	5 1/2	4	.16	
Complete Equipment	AN/SRA-20	25	18	23	6.0	

*Dimensions in inches, volume in cubic feet, weight in pounds, equipment boxed and ready for shipment.

SECTION 2
INSTALLATION

2-1. UNPACKING AND HANDLING.

Antenna Tuning Group AN/SRA-20 consists of two separate units packaged together for domestic shipment. These units are:

1. Tuner, RF TN-329/SRT.
2. Control, Tuner C-2372/SRT.

These units are accompanied by a kit of connectors and publications and a field change kit for Single Sideband Transceiver, RCA Model SSB-1.

a. INITIAL MECHANICAL CHECK. -Immediately after unpacking the equipment, it is necessary to make an initial mechanical check. Proceed as follows:

- (1) Carefully inspect the equipment for any damage incurred during shipment.
- (2) Make a preliminary mechanical check by rotating the control knobs of both the antenna tuner (TN-329/SRT) and the remote control (C-2372/SRT) to determine if they operate freely.
- (3) Check remote control (C-2372/SRT) and antenna tuner (TN-329/SRT) for broken meter glass.
- (4) Check both units for any loose mechanical parts.

2-2. SITE SELECTION.

Tuner, RF TN-329/SRT is to be located as close to the base of the antenna as possible. The antenna, a standard Navy type 66047 35-foot whip, should be located as far from ship's structure and other antennas as possible for maximum radiation efficiency. At the same time, the antenna base (and tuner) should be accessible for servicing and presetting of channels.

2-3. POWER REQUIREMENTS.

Input power to the remote control (C-2372/SRT) is 115 volts a-c, 60 cycles, 100 watts, (intermittent) applied to PL-205 and through fuse F-201 located on the front panel. Power is consumed only while channels are being changed. A separate power source is not necessary when operating with the SSB-1 transceiver.

2-4. INSTALLATION LAYOUT. -The relationship of the principal units of Antenna Tuning Group AN/SRA-20 is shown in Figure 1-1. Control, Tuner C-2372/SRT should be located conveniently close to the transmitter it serves and its controls should be readily accessible.

Tuner, RF TN-329/SRT should be located close to the base of the antenna it serves. The connection between the RF output terminal and the antenna should be as short as possible; less than three feet is recommended. The antenna foundation should be located so that the tuner is accessible for servicing and channel pretuning procedures.

Lengths of cables interconnecting the two units are not critical although they should be routed as directly as possible to minimize losses. This applies particularly to the RF transmission cable, type RG-10A/U.

No provision need be made for heat dissipation in either unit since heat dissipation is negligible.

2-5. INSTALLATION REQUIREMENTS.

a. INSTALLATION POINTERS.—Power requirements are 110-120 volts ac, 60 cycles single phase. When the equipment is operated with the SSB-1 transceiver, a separate power source is not necessary.

Cable installation should be in accordance with instructions given in NAVSHIPS 900,171. A solid copper ground strap not less than 0.5" wide and 0.20" thick should be installed between the ground stud located on the lower right rear corner of the tuner case and the nearest welded ship's structure. This will normally be the antenna foundation. This connection must be securely made on both ends since the ground strap is an important part of the radiation system.

b. OUTLINE DRAWINGS.—Outline drawings showing mounting dimensions and clearances are shown in Figures 2-1 and 2-2. A suggested method of installing Tuner, RF TN-329/SRT is shown in Figure 2-3.

c. INTERCONNECTING DIAGRAMS.—Interconnecting cables are shown in Figures 2-4a and 2-4b. Conductor connections are shown in Figures 2-5a and 2-5b. Connector data are shown in Figures 2-6a and 2-6b.

NOTE

Interconnecting cable types and conductor grouping may vary among installations. Refer to the applicable ship or station plans to determine the correct cabling for any specific installations.

d. CABLE ASSEMBLY.—Cable assembly instructions for standard multiconductor cables and connectors may be found in NAVSHIPS 900,171. Assembly details of RF connector type CG-941A/U with cable type RG-10A/U is shown in Figure 2-7.

2-6. INSPECTION AND ADJUSTMENTS.—Before energizing the equipment, all operating controls should be checked to see that they operate freely. Meter glass, vacuum capacitors, etc., should be checked for breakage which may have occurred during shipment or installation. Any broken parts should be replaced. See Section 6, Repair.

2-7. INTERFERENCE REDUCTION.—Antenna Tuning Group AN/SRA-20 is inherently a passive device, and therefore not a generator of interference; neither is it susceptible to interference from other equipments. However, it has incorporated in its RF circuitry a low-pass filter which effectively suppresses harmonics which might otherwise be radiated by improperly operated or adjusted transmitters.

2-8. PREPARATION FOR RESHIPMENT.—When this equipment is prepared for reshipment, the bowl insulator on the rear of the antenna tuner (TN-329/SRT) must be protected from mechanical shock. The meter and control knobs of the remote control, (C-2372/SRT) must be similarly protected since this unit has no outer cover.

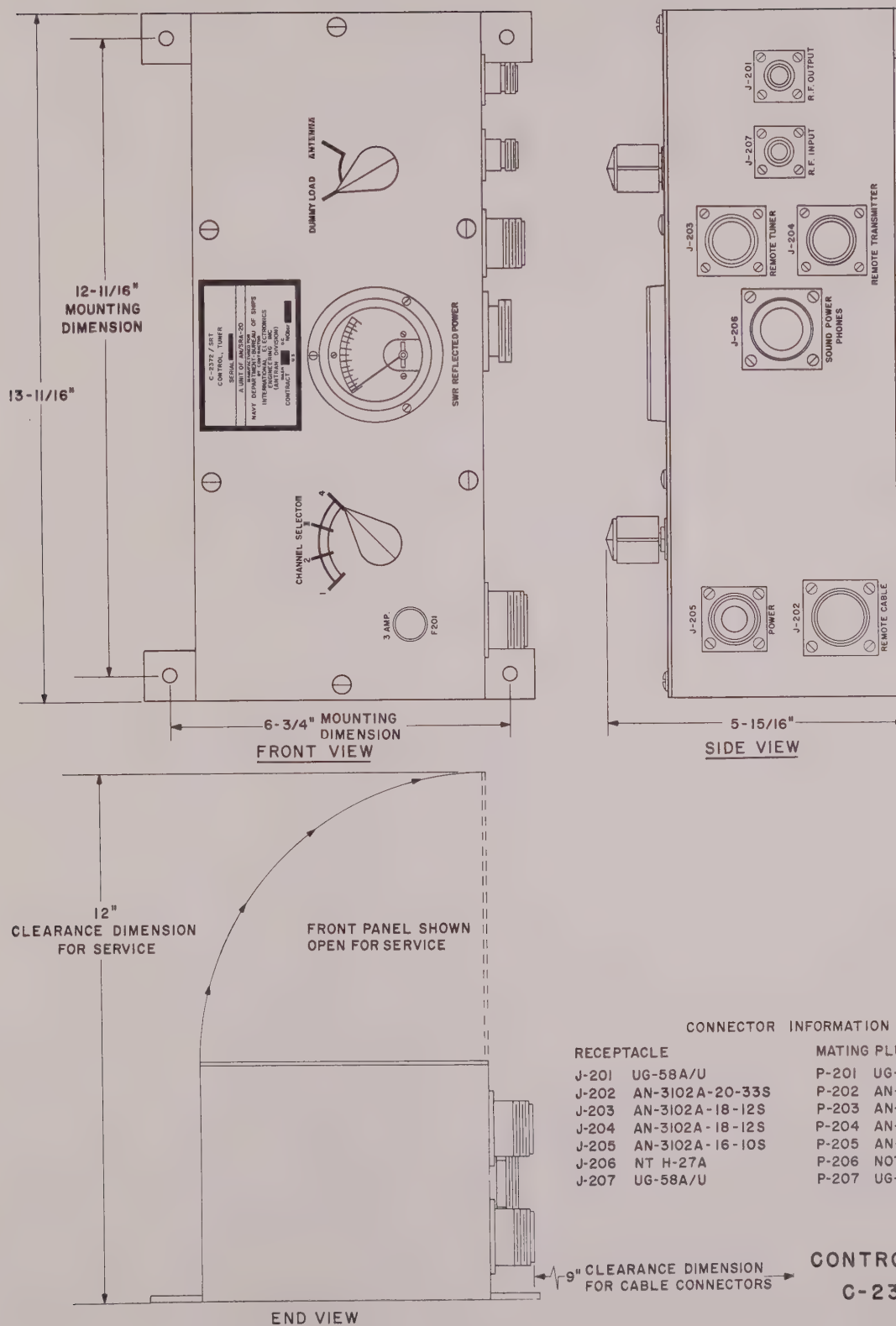


Figure 2-1. Control, Tuner C-2372/SRT, Outline and Mounting Dimensions

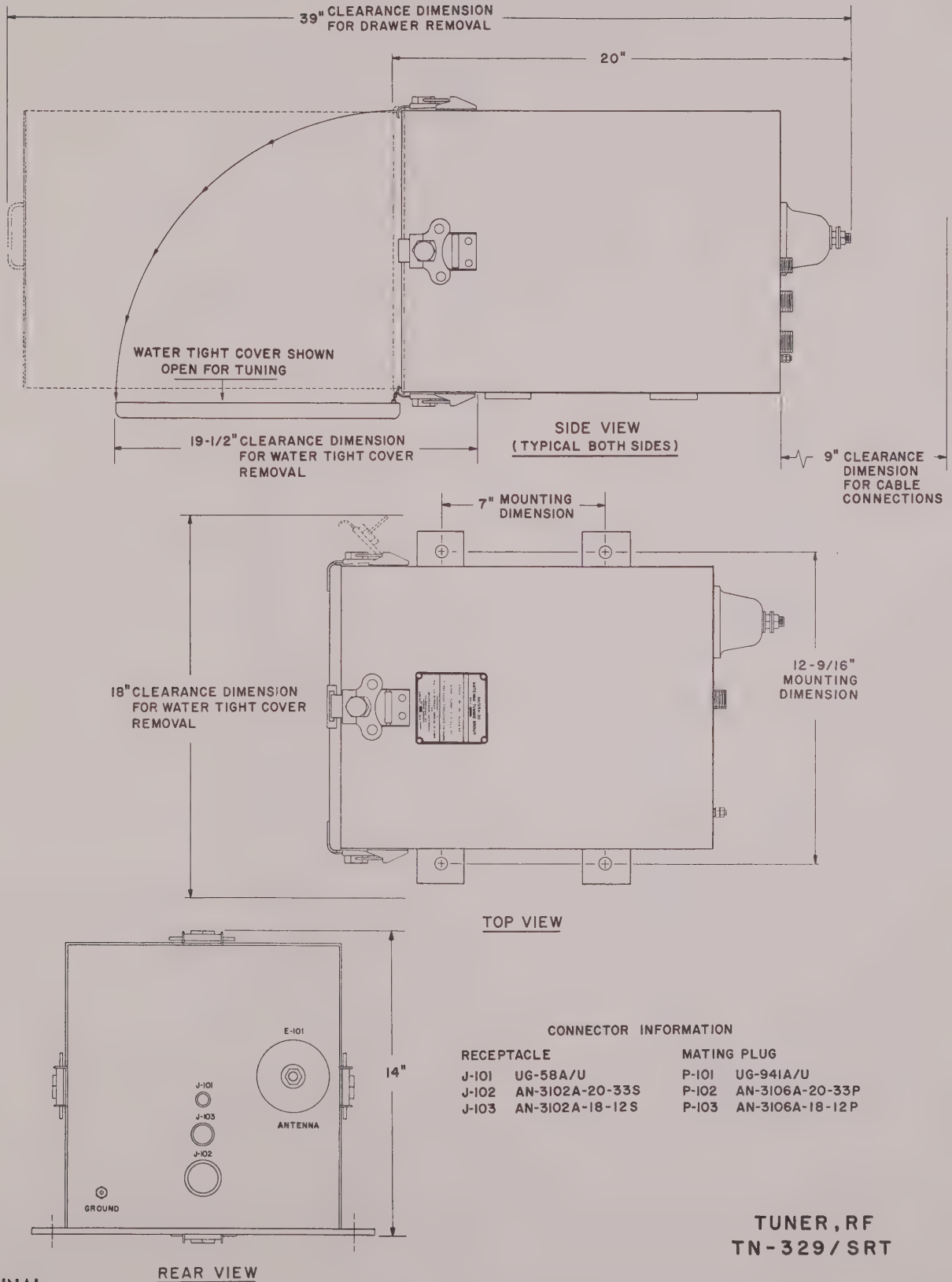


Figure 2-2. Tuner, RF TN-329/SRT, Outline and Mounting Dimensions

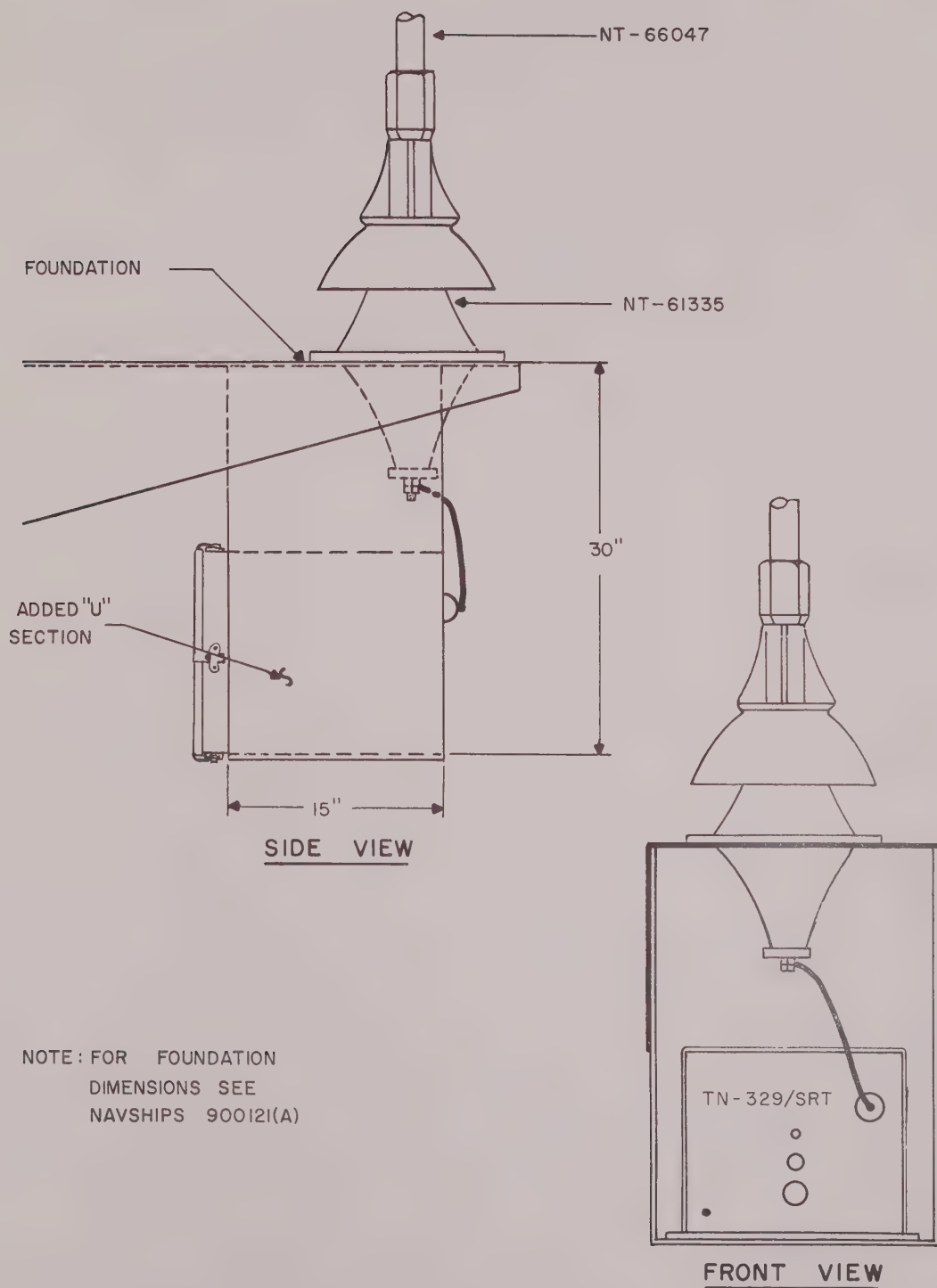
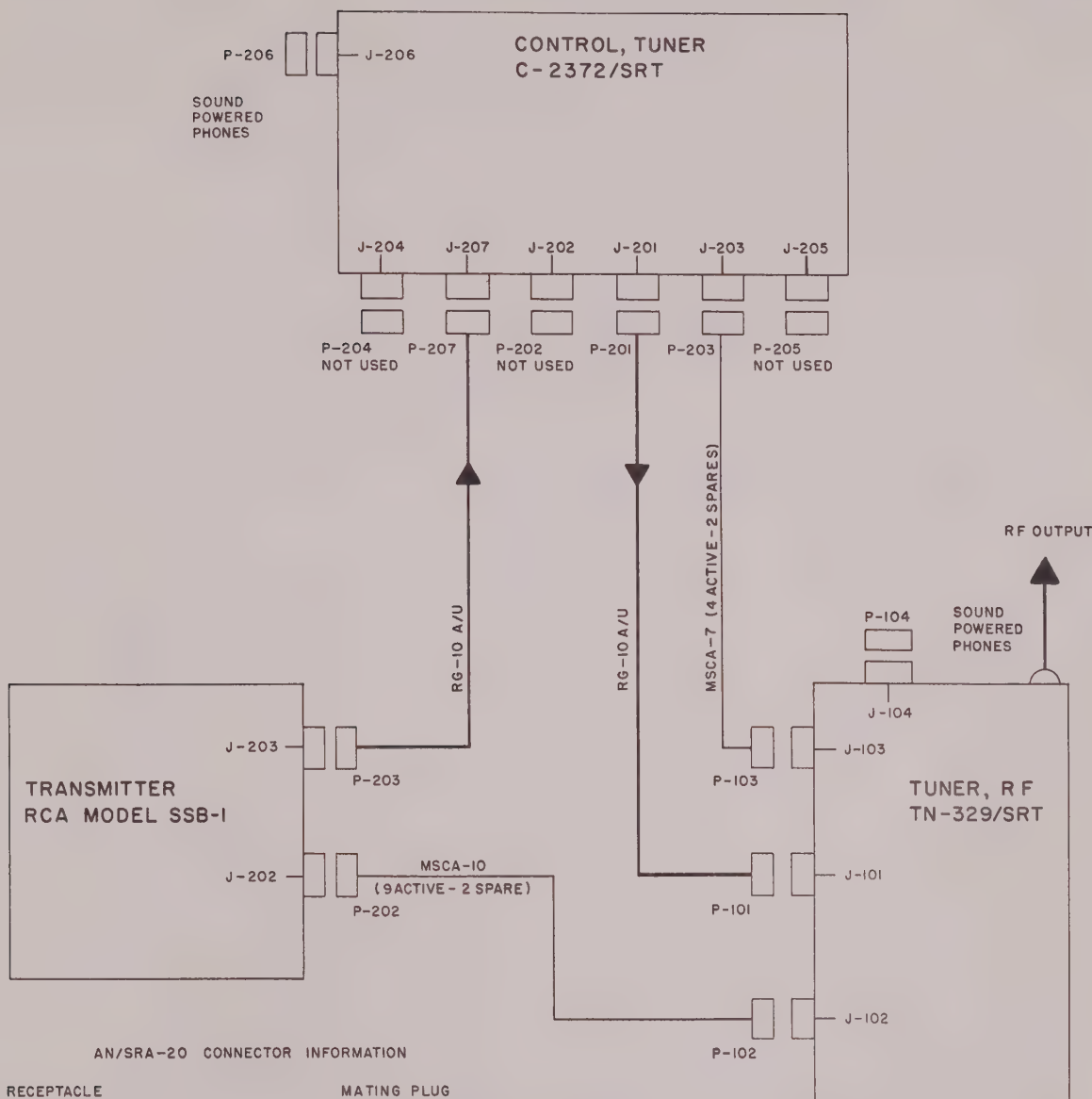


Figure 2-3. Suggested Installation of TN-329/SRT



AN/SRA-20 CONNECTOR INFORMATION

RECEPTACLE

J-101 UG-58/U
J-102 AN-3102A-20-33S
J-103 AN-3102A-18-12S
J-104 NT H-27A
J-201 UG-58/U
J-202 AN-3102A-20-33S
J-203 AN-3102A-18-12S
J-204 AN-3102A-18-12S
J-205 AN-3102A-16-10S
J-206 NT H-27A
J-207 UG-58/U

MATING PLUG

P-101 UG-941A/U
P-102 AN-3106A-20-33P
P-103 AN-3106A-18-12P
P-104 NOT FURNISHED
P-201 UG-941A/U
P-202 AN-3106A-20-33P
P-203 AN-3106A-18-12P
P-204 AN-3106A-18-12P
P-205 AN-3106A-16-10P
P-206 NOT FURNISHED
P-207 UG-941A/U

NOTE: BLANK RECEPTACLES ON CONTROL TUNER NOT USED WITH SINGLE SIDEBAND TRANSMITTER RCA MODEL SSB-I

TRANSMITTER, RCA MODEL SSB-I CONNECTOR INFORMATION

RECEPTACLE

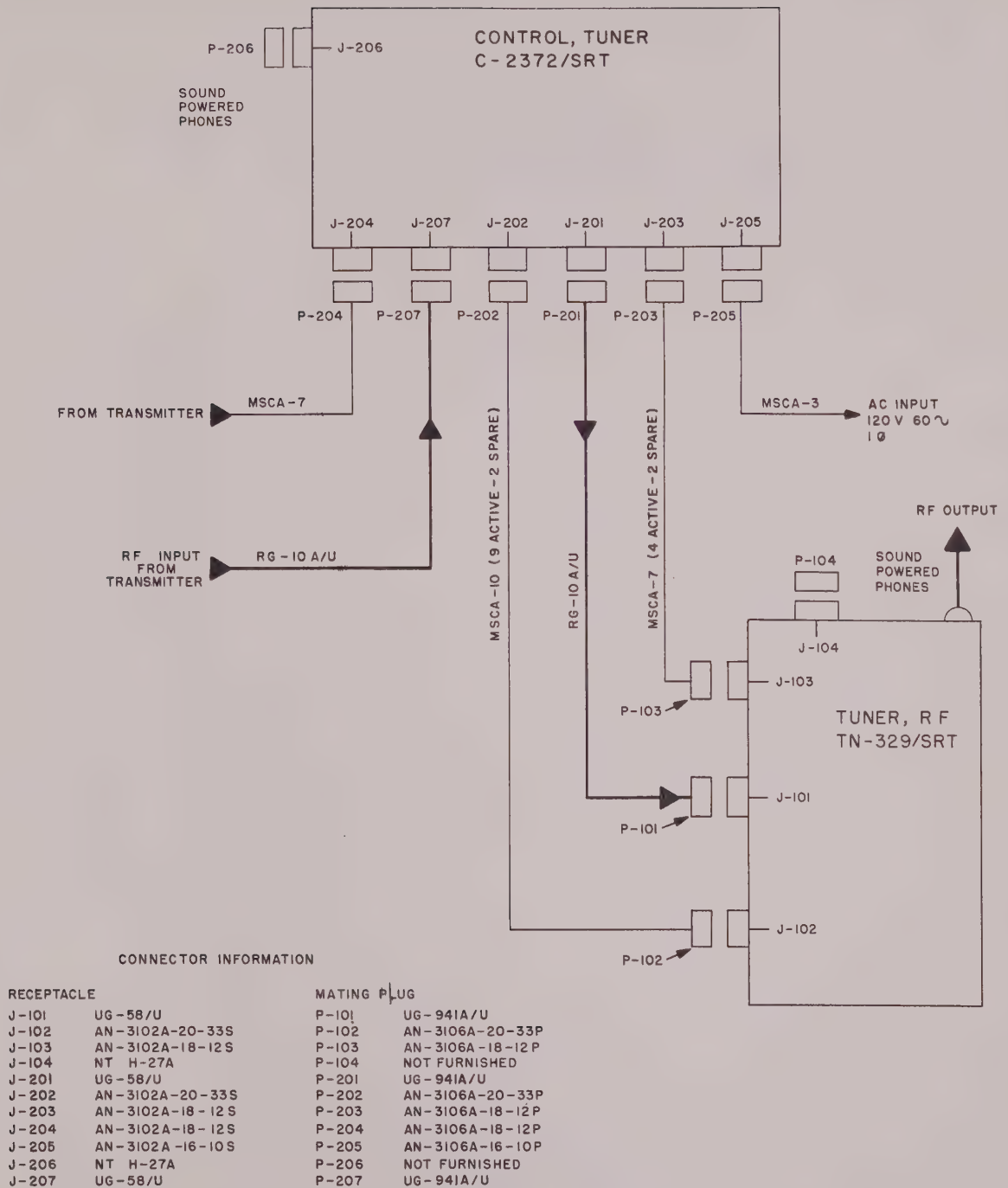
J-202 AN-3102A-20-33S
J-203 UG-58/U

MATING PLUG

P-202 AN-3106A-20-33P
P-203 UG-21D/U

*7 conductors
9 conductors*

Figure 2-4a. Antenna Tuning Group AN/SRA-20, Interconnecting Cables when Used with SSB-I Transmitter



NOTE: ASSOCIATED TRANSMITTER MUST BE
EQUIPPED FOR CHANNEL SWITCHING
WITH THIS SYSTEM OF INTER CABLING

**Figure 2-4b. Antenna Tuning Group AN/SRA-20, Interconnecting Cables when
Used with Utility Transmitter**

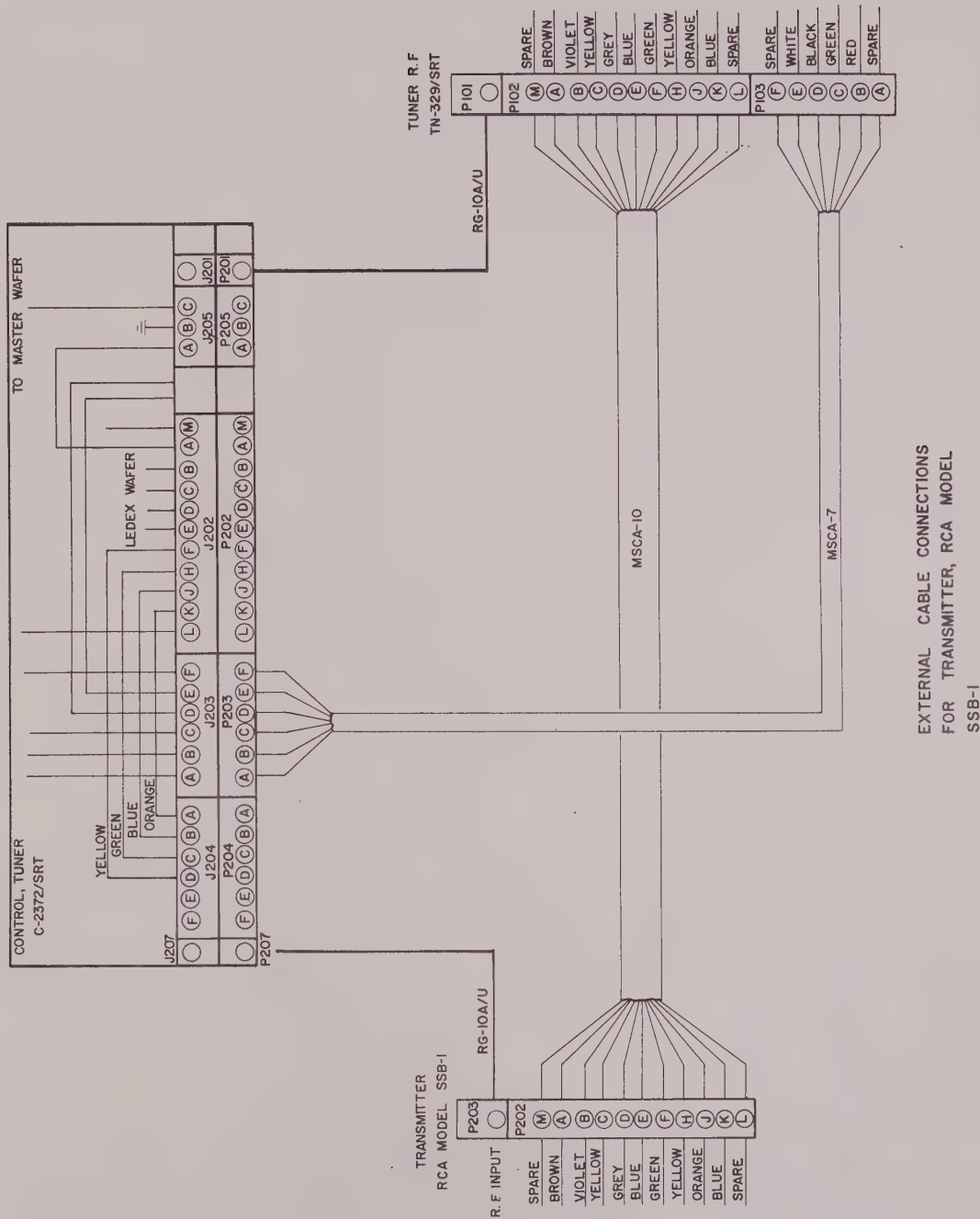


Figure 2-5a. Antenna Tuning Group AN/SRA-20, Cable Connection Data When Used with SSB-I Transmitter



SECTION 2
Figure 2-6a

NAVSHIPS 93202

AN/SRA-20
INSTALLATION

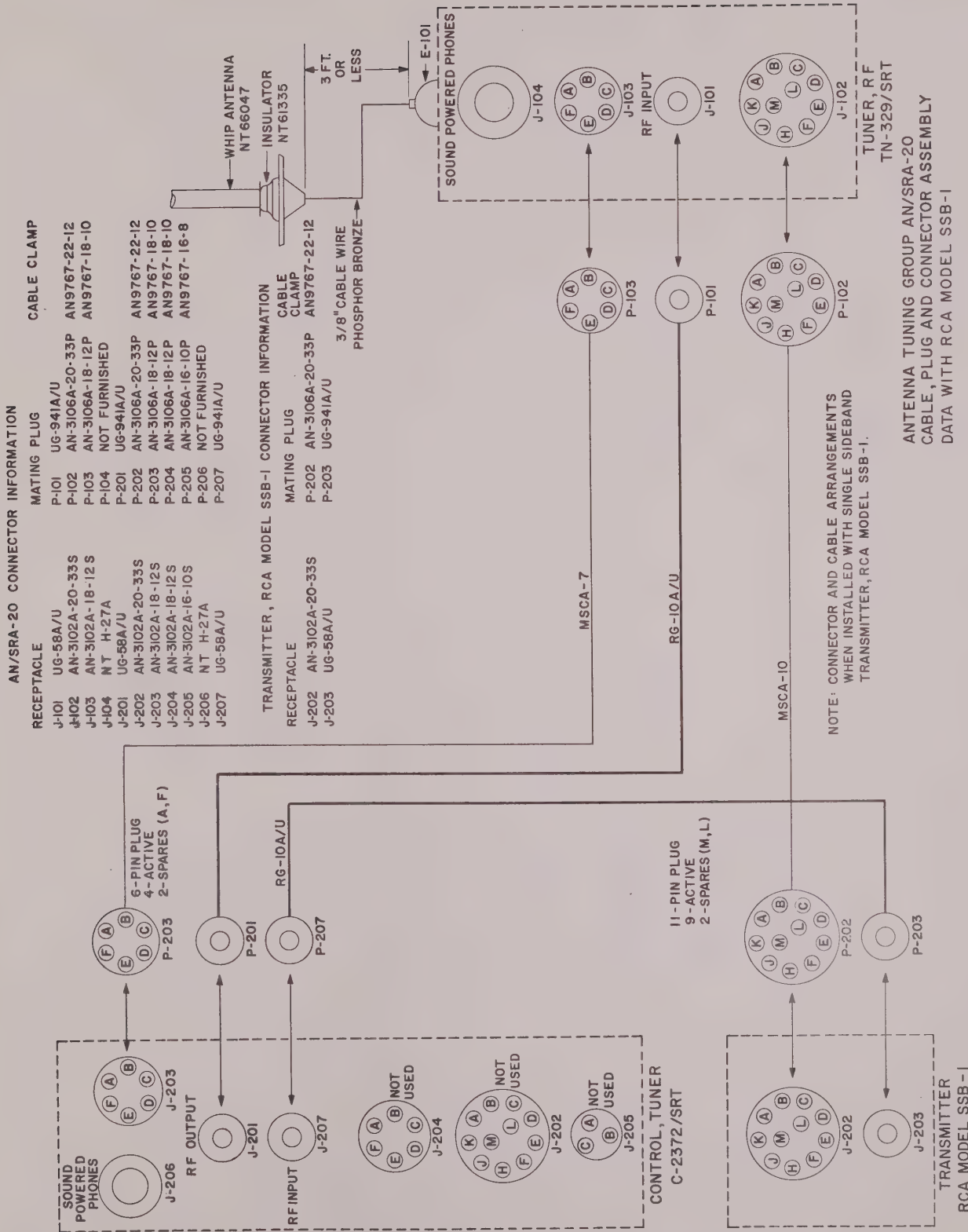


Figure 2-6a. Antenna Tuning Group AN/SRA-20, Connector Data when Used with SSB-1 Transmitter

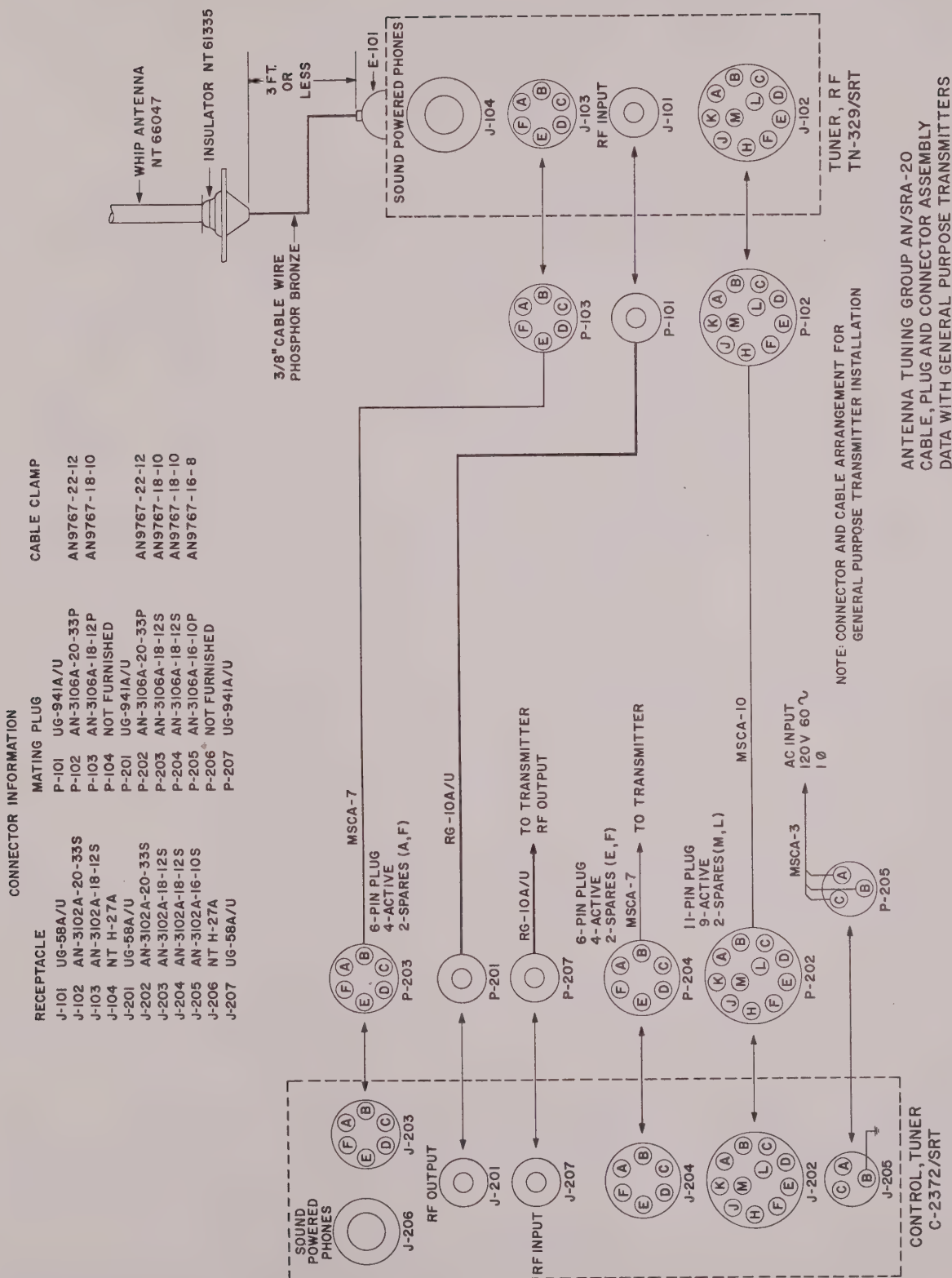


Figure 2-6b. Antenna Tuning Group AN/SRA-20, Connector Data when Used with Utility Transmitter

SECTION 3
OPERATOR'S SECTION

3-1. FUNCTIONAL OPERATION.—Antenna Tuning Group AN/SRA-20 is a semi-automatic device that provides a means for matching the antenna to the transmitter RF output on four separate frequencies. After the four frequencies are pretuned on different channels, operation of the AN/SRA-20 is completely automatic and channel switching is accomplished from the associated transmitter, if suitable circuitry is provided, or from the remote control (C-2372/SRT). The antenna tuner (TN-329/SRT) functions simply as an LC circuit in series with the antenna to either increase or decrease inductance or capacitance in the antenna circuit, thus increasing or decreasing the effective length of the antenna, and includes an autotransformer to match the impedance of the antenna to the RF output impedance of the associated transmitter. A standing-wave-ratio indicator is provided on the front panel of the antenna tuner (TN-329/SRT) and remote control (C-2372/SRT) to provide visual tuning indications. In addition, the TN-329/SRT provides a remote reading plate current meter used for reequipment tuning. A 50-ohm, 100-watt dummy antenna load resistor contained in the C-2372/SRT enables the transmitter to be initially tuned into the dummy load for impedance matching, then switched directly to the antenna tuner (TN-329/SRT) and antenna NT-66047.

3-2. DESCRIPTION OF CONTROLS.

a. TUNER RF TN-329/SRT.—The operator should become familiar with the operating controls before proceeding with the actual tuning. Refer to Figures 3-1 and 3-2 for a pictorial view of the operating controls.

(1) TRANSMITTER ON-OFF switch (G) —Keys the transmitter, applying RF power to the antenna tuner.

(2) CHANNEL SELECTOR (B) —Allows four circuits to be operated from a single autotransformer; thus the impedance of the antenna can be matched to the impedance of the transmitter on four channels. In positions 1 through 4 all sliding roller contacts, except for the one being used, are raised and do not make contact with the autotransformer.

(3) AUTOTRANSFORMER Control (B) —Scans the sliding roller contact selected by CHANNEL SELECTOR A for an impedance match between antenna and transmitter.

(4) CHANNEL SELECTOR (C) —Selects and lowers a sliding roller contact on the low frequency loading coil. In position 1, the contact for channel 2 is raised and does not make contact with the coil. In position 2, channel 1 contact is raised. On OPER position all contacts are lowered to allow for remote selection of individual channels.

(5) CHANNEL 1 & 2 2-6 MC Control (D) —Enables the sliding roller contact selected by CHANNEL SELECTOR- (C) to scan the loading coil and tune the antenna in the frequency range 2 to 6 mc.

(6) CHANNEL 3 6-13 MC Control (E) —Enables the operator to tune channel 3 high frequency loading coil (6 to 15 mc) direct.

(7) CHANNEL 4 Tuning Coil (F) —Enables the operator to tune channel 4 high frequency loading coil (6 to 15 mc) direct.

(8) CHANNEL 4 CAPACITANCE Switch (H) .—Selects either a 6 or 10 $\mu\mu\text{fd}$ capacitor on channel 4 only. At frequencies where antenna resonance lies outside of the range of the 6 $\mu\mu\text{f}$ capacitor it will be necessary for the operator to select the 10 $\mu\mu\text{f}$ capacitors to bring the antenna into resonance.

b. CONTROL TUNER C-2372/SRT.

(1) DUMMY LOAD-ANTENNA Switch. —Selects either a 50-ohm, 100-watt load for tuning purposes, or connects transmitter direct to the antenna via the antenna tuner unit.

(2) CHANNEL SELECTOR. —Enables the operator to select any one of four pre-tuned channels for automatic remote operation. This switch is not normally connected for use when transceiver SSB-1 is used. Field Change 2-SSB-1 permits the modification of the transceiver to permit channel selecting of the antenna tuner by the channel switch on the front panel of the SSB-1.

HALF PAGE CLOSE UP PHOTOGRAPH
OF
FRONT PANEL OF TUNER RF TN-329/SRT

Figure 3-1

HALF PAGE CLOSE UP PHOTOGRAPH
OF
FRONT PANEL OF CONTROL, TUNER C-2372/SRT

Figure 3-2

3-3. TUNING PROCEDURE.

Although it is possible for one man to accomplish the tuning procedure by himself, this is not recommended. One man should operate the antenna tuner and another the transmitter and remote control unit. The units are provided with receptacles for use of standard Navy sound powered phones during the tuneup steps.

- STEP 1. On the remote control (C-2372/SRT) set the DUMMY LOAD-ANTENNA control to CHANNEL SELECTOR to desired channel.
- STEP 2. Tune transmitter on desired frequency into the 50-ohm dummy load, noting the PA plate current reading. When tuning at frequencies from 2 to 16 mc it is necessary to use channels 1 or 2 only. Channels 3 and 4 tune frequencies from 6 to 15 mc.

WARNING

Do not operate Antenna Tuning Group AN/SRA-20 with a power input greater than 100 watts.

- STEP 3. After the transmitter has been tuned, set DUMMY LOAD-ANTENNA control to ANTENNA.
- STEP 4. On the TUNER RF TN-329/SRT set CHANNEL SELECTOR (control (A)) to the desired channel. This should be the same as the channel previously selected at the remote control panel.
- STEP 5. Set CHANNEL SELECTOR (control (C)) to desired channel. If channel 3 or 4 is to be used, set control (C) to OPER position.
- STEP 6. Rotate the AUTOTRANSFORMER (control (B)) SLOWLY in a counterclockwise direction until it stops. Note the dial reading and rotate the control 16 turns clockwise. This allows the sliding roller contact to rest on the center point of the autotransformer.

CAUTION

When using controls (B), (D), (E), or (F), approach both maximum and minimum of the autotransformer and all loading coils slowly to avoid any damage to the sliding roller contacts as they hit against the stops.

- STEP 7. Rotate control (D), (E), or (F) (depending on the channel in use) counterclockwise SLOWLY until it stops. This positions the sliding roller contact to minimum inductance on the coil in use. At this time it is necessary to establish two-way communications between personnel located at the transmitter and the antenna tuner unit. The antenna tuner and the remote control unit have provisions for sound powered telephones.

STEP 8. Key the transmitter using control (G) and tune control (D), (E) or (F) (whichever is being used) for minimum indication on the SWR REFLECTED POWER meter. If the PA plate current and the antenna current readings do not coincide with those of step 2, alternately tune controls (B) and (D), (E) or (F) for minimum indication on the SWR REFLECTED POWER meter until the readings are equal to those of step 2. When this condition exists, the antenna is matched to transmitter and the tuning operation is complete for one channel. Channel 4 should always be selected for the highest of the frequencies to be used. Channel 4 employs either 6 or 10 $\mu\mu\text{f}$ of capacitance in series with the antenna to allow easier tuning of the higher frequencies. This capacitance is selected by CHANNEL 4 CAPACITANCE control (H) in the 10 $\mu\mu\text{f}$ position. Perform steps 1 through 8. If this procedure produces no dip on the SWR REFLECTED POWER meter, turn control (H) to 6 $\mu\mu\text{f}$ and repeat step 8. The position of control (H) will depend on the location of the antenna and its relationship to nearby structures and other antennas.

NOTE

A rise in PA plate current accompanied by a decrease in reflected power current indicates tuning in the correct direction. If reflected power current increases, reverse direction of tuning.

- STEP 9. Repeat steps 1 through 8 for the other 3 channels.
- STEP 10. Unkey transmitter using control (G).
- STEP 11. Place controls (A) and (C) in OPER position.
- STEP 12. Remove sound powered phones.
- STEP 13. Close watertight cover securely.

Any of the four channels may now be selected remotely at the remote control unit on transmitter.

CAUTION

When it becomes necessary to change an antenna tuner frequency after all 4 channels have been initially set up, it is imperative that the operator does not disturb the setting of any channel except the channel being changed. If, by error, the settings are disturbed, it will be necessary to reset the channel in question.

SECTION 4

PRINCIPLES OF OPERATION

4-1. OVERALL FUNCTIONAL DESCRIPTION.

a. **THEORY OF STANDING WAVES.**—A transmission line of infinite length has distributed along its entire length, resistance, capacitance and inductance. Since the line is of infinite length, a wave started at the sending end will continue to travel out to infinity and will never be reflected. If the line is of finite length however, and terminated in a resistance that doesn't completely absorb the transmitted energy, the unabsorbed energy will travel back to the source in the form of a reflected wave. If, on the other hand, the load absorbs all the energy, there is no variation or disturbance at the sending end which would indicate the line was other than infinite length. The value of the resistance which produces this result is called the characteristic impedance and since the energy is completely absorbed in the load, it is clear that the distributed inductance and capacitance of the line have ceased to make their presence apparent and the load appears as a pure resistance.

When improperly terminated, the reflected wave appears at the input terminals of the transmission line as a voltage which in effect is in series with a resistance equal to the characteristic impedance of the line. The voltage will either assist or oppose the input voltage depending on the phase relation as it reaches the input terminals. If the length of the line is such that the reflected wave arrives in aiding phase, the effective input impedance of the line will be lowered. If the reflected wave arrives in opposing phase, the effective impedance is higher. A line which is terminated in a resistive load which is not equal to its characteristic impedance will have reflected as well as incident waves along its length. The sum of these voltages at any point will vary with the phase relation of these two waves. The variation of voltage along the length of the transmission line is called a "standing wave", the measures of which is known as the "standing wave ratio" (SWR). The standing wave ratio is defined as the ratio of the largest measured voltage along the line to the smallest. Since the incident power is the paramount factor in the transfer of energy to the load, it becomes clear that the circuit parameters must be such as to minimize the reflected power. The adjustment of the load becomes the deciding factor in this instance. However, the fundamental power transfer laws apply and the "sending" and "receiving" ends of the transmission line must be matched to effect maximum efficiency. It should be noted that the SWR is a function of the load at the terminal end of the line and is not influenced by conditions at the sending end such as transmitter tuning.

If a transmission line is terminated with an impedance load which is not resistive, it becomes necessary to compensate for the inductive and capacitive components in order to achieve the ideal transfer characteristics previously referred to. Assume an antenna replaces the resistive load; then two conditions must prevail: First, at the desired frequency the physical dimensions must be varied until the reactive components are equalized. This condition exists when the total effective length of the antenna plus the variable transmission line is an odd multiple of quarter wave lengths. The highest efficiency usually corresponds to the smallest number of quarter waves achievable, which is the shortest length of non-radiating

variable line in the circuit. To effect the second requirement the transmission line must introduce its power into the antenna where voltage and current relationship afford an impedance equal to the characteristic impedance of the transmission line.

Summarizing, optimum transfer of power in a transmission line exists when: 1) the power source matches the characteristic impedance of the transmission line, 2) the capacitive and inductive reactances are equalized, 3) the transmission line introduces its power into a load equal to its characteristic impedance.

b. ANTENNA TUNING (GENERAL).—An antenna is tuned by varying either its physical or electrical components. While the former method gives a more advantageous distribution of voltages along the antenna, varying the electrical components offers a more feasible approach to the operation over a wide range of frequencies which would render the physical adjustments impracticable. The electrical characteristics of an antenna system may be varied by introducing capacitors, inductors or sliding systems which short out various parts of the antenna system. A capacitor in series with an antenna decreases its effective length. An inductance in series with an antenna increases its effective length. Because antenna tuner AN/SRA-20 must be capable of resonating a 35-foot whip antenna over a wide range of frequencies, all the methods outlined are used.

4-2. ANTENNA TUNING GROUP AN/SRA-20.—Antenna Tuning Group AN/SRA-20 is provided with the following units and tuning aids which are illustrated in the block diagram Figure 4-1. 1) A low pass filter (Z-201) for the suppression of transmitter

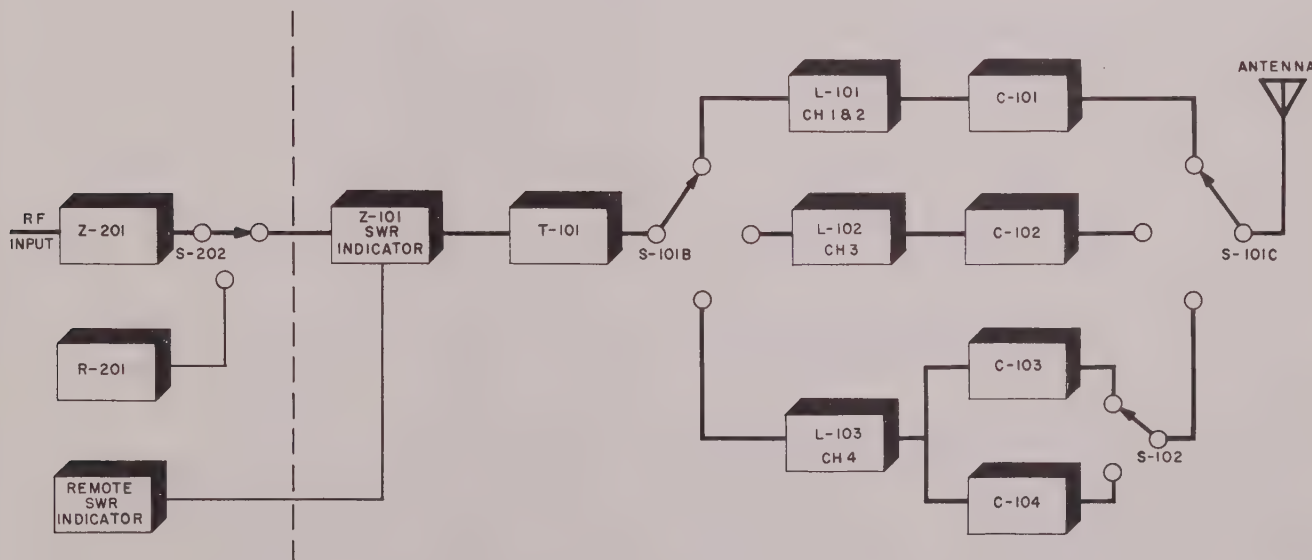


Figure 4-1. Antenna Tuning Group AN/SRA-20, Functional Block Diagram

harmonics above 32 megacycles, 2) a dummy antenna for initial adjustment of the transmitter, 3) a bridge network (Z-101) which has been adapted to the circuitry to indicate the standing wave ratio or reflected power. Referring to Figure 4-2, the bridge consists of one pair of resistive arms and one pair of capacitive arms. Since the system is designed for a 50-ohm transmission line, the components in the bridge approach balance when the autotransformer and antenna capacitors and inductances are adjusted to present a 50-ohm load to the transmitter. Under this condition the reflected power is at a minimum and the meter M-101, which is arbitrarily calibrated, indicates a minimum deflection. 4) An autotransformer (T-101) which serves as an impedance matching device. 5) Variable inductance L-101 thru L-103 and series capacitors G-107 thru G-110.

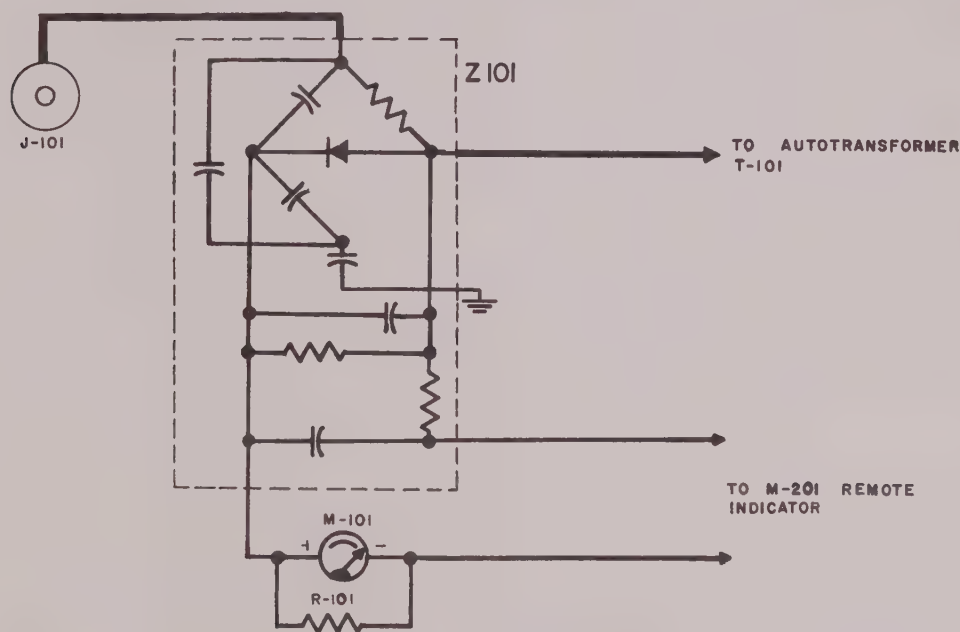


Figure 4-2. Circuit of SWR Reflected Power Meter

Mechanical devices are associated with the above units in order to facilitate local and remote tuning and adjustments. A switch (S-202) permits the output of the transmitter to connect to either the built-in dummy load or RF power-handling portion of the tuner. (See Figure 4-3). An element of switch S-101-B changes the input/output ratio of the autotransformer to make the necessary impedance-matching to the antenna as the frequency is changed. Another switch element, S-101-C connects the antenna to appropriate inductance and capacitance for any of four frequencies. (See Figure 4-4). It will be noted that two tuning coils are used at the higher frequencies (6-15 mc) to reduce the interaction which would otherwise result if one coil with four taps were used.

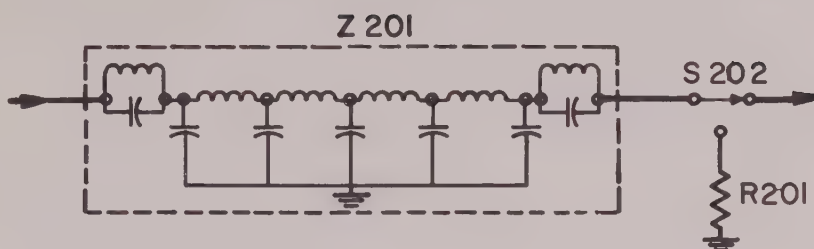


Figure 4-3. RF Power-Carrying Elements of C-2372/SRT

4-3. ELECTRICAL-MECHANICAL OPERATION.—To facilitate frequency change, component elements which are common to a particular frequency have been "ganged" so that a single operation automatically selects the required operating condition. In order to preset this facility, two rotary cams located in the antenna tuner (TN-329/SRT), allow 4 circuits to be adjusted on the autotransformer (T-101) and two circuits on the single tuning coil (L-101). The autotransformer cam consists of a cylindrical surface upon which five independent flat surfaces have been machined. Four of these surfaces actuate "V" levers to which are attached rods which are axially parallel to the coil. Roller discs with V-grooved edges slide along these rods and engage any turn according to necessary adjustment. The cam actuates the rods in sequence so that only one sliding disc (contact) engages the coil at a time and lifts up the other rods and sliders so that tuning for just one channel can be effected. When the sliding discs have been adjusted, the cam is turned to its fifth position and all discs engage the coil. The selector switch, which is slaved to the master control switch in the remote control, then picks up the particular tap when the relay system is set for operation on a selected channel. The "ganging" of the circuit elements is illustrated in Figure 4-4.

NOTE
SWITCH NUMBERS REFER
TO CHANNEL POSITIONS

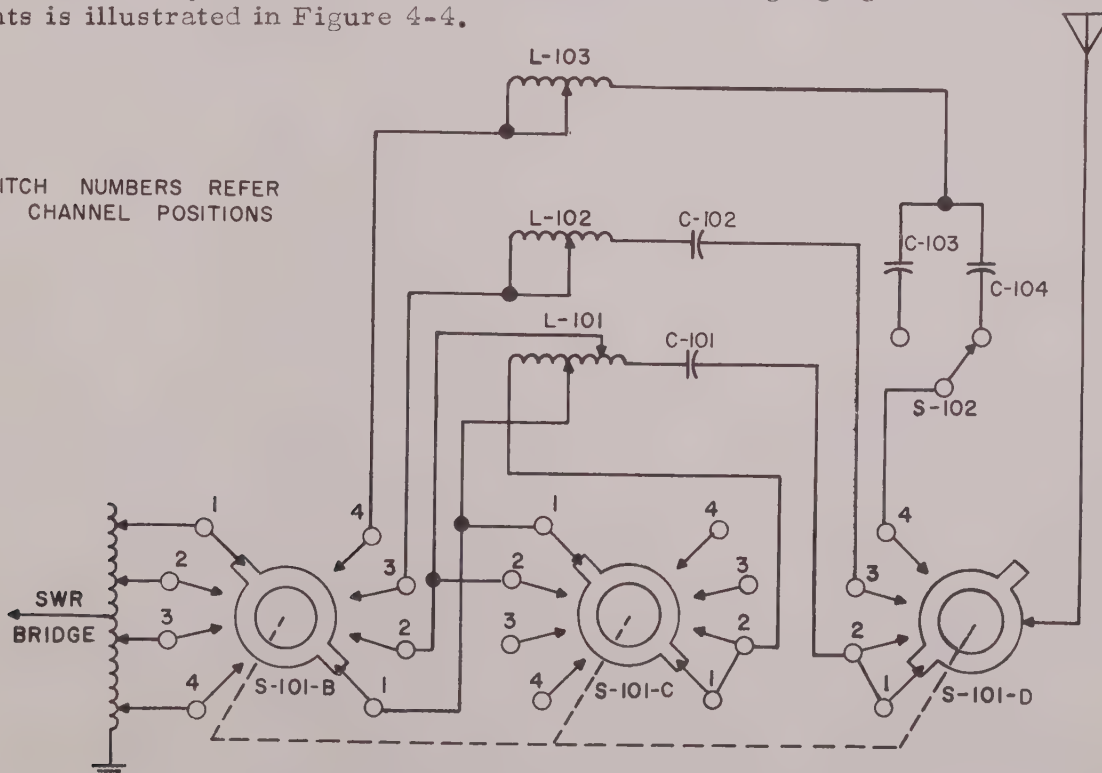


Figure 4-4. RF Power-Carrying Elements of TN-329/SRT

SECTION 5
TROUBLE-SHOOTING

5-1. OVERALL TROUBLE-SHOOTING.

a. PRELIMINARY CHECKS.

Inspect all cables as shown in Figure 2-6a and 6-5a or 2-6b and 6-5b (depending on the individual installation) for proper connection and tightness of plugs. Also check the ground strap on the case of the tuner (TN-329/SRT).

Visually inspect meters M101 and M102 of TUNER RF TN-329/SRT and M201 and fuse F201 of CONTROL TUNER C-2372/SRT (Figure 5-1 and 5-2).

b. TEST EQUIPMENT.

The only test instruments necessary to accomplish repairs to the Antenna Tuning Group AN/SRA-20 are a multimeter and a capacitance bridge, although a vacuum tube volt-ohmmeter may be used in checking Control, Tuner C-2372/SRT.

c. CONTROL SETTINGS.

Before accomplishing any trouble-shooting, the technician is cautioned to insure that all controls of Control, Tuner C-2372/SRT and Tuner, RF TN-329/SRT are aligned to the same channel. This is imperative in order to maintain proper circuit continuity throughout the AN/SRA-20 Antenna Tuning Group.

FULL PAGE
PHOTOGRAPH SHOWING
TEST POINTS OF TUNER, RF TN-329/SRT

Figure 5-1.

FULL PAGE
OF
PHOTOGRAPH SHOWING
TEST POINTS OF
CONTROL, TUNER C-2372/SRT

Figure 5-2

TABLE 5-1. ANTENNA TUNING GROUP AN/SRA-20
TYPICAL TROUBLES

SYMPTOM	COMPONENTS AFFECTED	CAUSE
No transmitter load	W-201 W-202 W-203 S-202 Z-201 R-201	Open or shorted " " Open, shorted or not in Dummy Load Position Defective Open or shorted
No tuning indication	Interconnecting cables S-202 Z-101 M-101 M-102 M-201 R-113 R-202 W-101 W-204	Open, shorted or improperly connected Not in antenna position Defective Open " " Shorted " Open or shorted "
Excessive tuning indication	S-201 Controls A or C F-201 B-101 CR-102 Wafers S-101A S-101B S-101C S-101D S-102 S-201 J-101	Not aligned to channel Not aligned to proper channel Open Open or shorted Defective Defective " " " " " Open or shorted.
No PA plate current	M-102 S-103 P-102 P-202 P-103 P-202	Defective Open or shorted Not properly connected or defective wiring " " "

SYMPTOM	COMPONENTS AFFECTED	CAUSE
Excessive PA plate current	M-102	Transmitter improperly tuned
	M-101	Tuner improperly tuned
	M-201	"
	P-102	Transmitter improperly tuned
	P-202	"
	S-202	"
	W-101	Open or shorted
	W-201	"
	W-202	"
	W-204	"
	Z-101	Defective
	Z-201	"

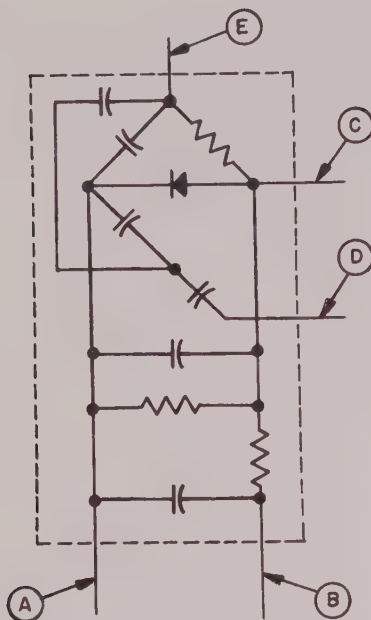


Figure 5-3. Check Points on Rear of Z101

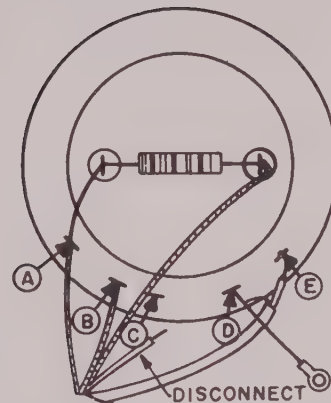


Figure 5-4. Schematic Diagram of Z101 Showing Check Points

NOTE

Z-101 is not repairable. The schematic diagram is included for reference only.

b. CAPACITORS.

Most capacitance bridges in general use will not normally check values below 10 $\mu\mu\text{fd}$. In order to read C104 (6 $\mu\mu\text{fd}$) with any degree of accuracy, it will first be necessary to measure C103 (10 $\mu\mu\text{fd}$) between points A and C, and then clip points A and B together as shown in partial schematic Figure 5-4. This will allow a measurement of the total capacitance of C-103 and C104 together. This should be approximately 16 $\mu\mu\text{fd}$. The value of C104 may then be computed by subtracting the smaller measurement from the larger. This should be approximately 6 $\mu\mu\text{fd}$.

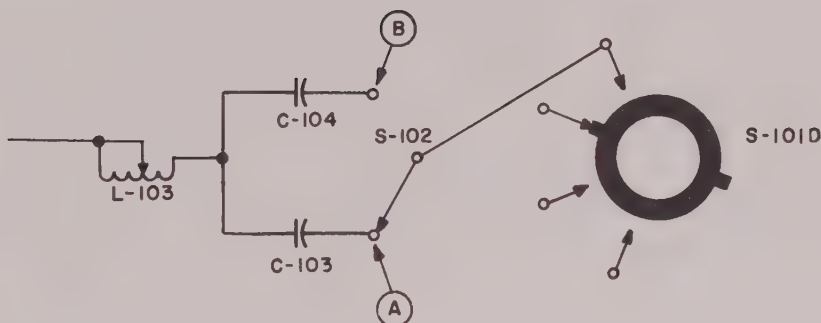


Figure 5-5. Test Points for Measuring C104

c. LOW PASS PRESELECTION NETWORK Z201.

This unit may be suspected when everything else in the ANTENNA GROUP AN/SRA-20 has been checked and appears to be normal and:

- (1) Either the lower or upper frequency limits of the AN/SRA-20 will not tune properly, or
- (2) The associated transmitter causes interference (harmonic) to other electronics equipment above 32 megacycles.

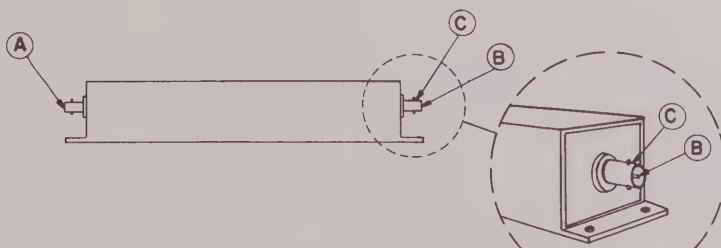


Figure 5-6. Tests Points for Low Pass Preselection Network Z201

TABLE 5-3. TROUBLE-SHOOTING DATA FOR Z201

USE: Multimeter Check Points:		USE: Multimeter Check Points:	
A - B	0 ohms	B - C	720 $\mu\mu\text{fd}$
A - C	INF.		

If measurements in Table 5-3 appear to be normal, proceed to check the insertion loss curve shown in Figure 5-7.

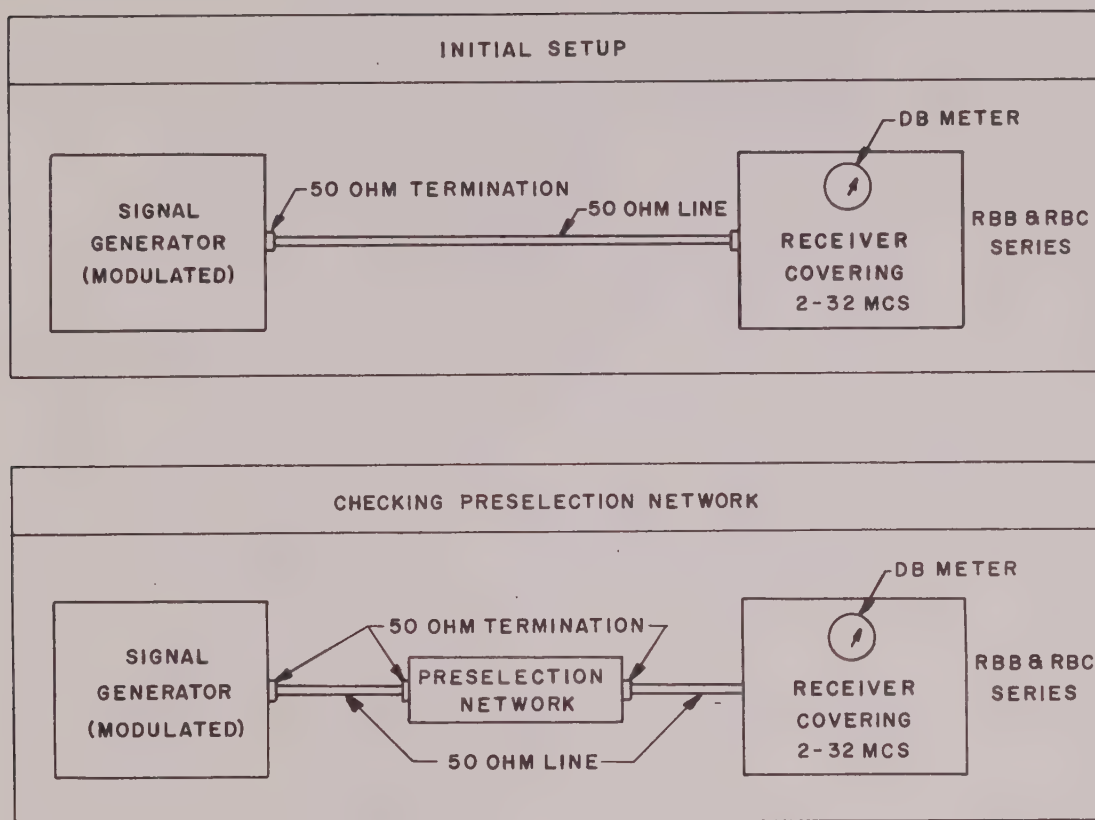


Figure 5-7. Test Setup for Measuring Insertion Loss of Low Pass Preselection Network Z201

Using a signal generator (modulated) with a 50-ohm termination and a receiver having a db meter, (See Figure 5-7), set the receiver on 2 megacycles, function switch to modulate, AVC.

Adjust the output of the signal generator (modulated) for maximum deflection on the db meter. Record this reading. Disconnect the cable between the signal generator and the receiver. Insert the preselection network between the generator and the receiver, noting the db meter reading. There should not be any more than a 0.5 db difference in readings.

Repeat the above steps every 0.5 megacycles until 32 megacycles is reached. The db loss throughout the range should not exceed .5 db. Above 32 megacycles the insertion loss should increase rapidly as shown in Figure 5-8.

NOTE

If Z201 is found to be defective and no replacement is available, it may be temporarily bypassed with a short length (10-15 in.) of RG-58A/U cable equipped with UG-88/U connectors and UG-914/U adapters on both ends.

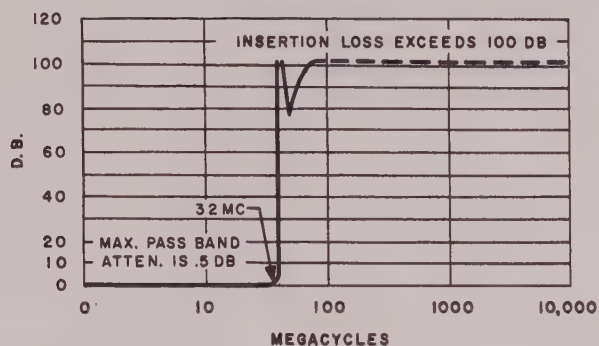


Figure 5-8. Typical Insertion Loss Curve of Low Pass Preselection Network Z201

CAUTION

Do not attempt to repair Z201. Special laboratory equipment and techniques are necessary.

SECTION 6

REPAIR

6-1. FAILURE REPORT.

"Report each failure of the equipment, whether caused by a defective part, wear, improper operation, or an external cause. Use **ELECTRONIC FAILURE REPORT** form DD787. Each pad of the forms includes full instructions for filling out the forms and forwarding them to the Bureau of Ships. However, the importance of providing complete information cannot be overemphasized. Be sure that you include the model designation and serial number of the equipment (from the equipment identification plate), the type number and serial number of the major unit (from the major unit identification plate), and the type number and reference designation of the particular defective part (from the technical manual). Describe the cause of the failure completely, continuing on the back of the form if necessary. Do not substitute brevity for clarity. And remember--there are two sides to the failure report.

"YOUR SIDE"

"Every **FAILURE REPORT** is a boost for you:

1. It shows that you are doing your job.
2. It helps make your job easier.
3. It insures available replacements.
4. It gives you a chance to pass your knowledge to every man on the team.

"BUREAU SIDE"

"The Bureau of Ships used the information to:

1. Evaluate present equipment.
2. Improve future equipment.
3. Order replacements for stock.
4. Prepare field changes.
5. Publish maintenance data.

Always keep a supply of failure report forms on board. You can get them from the nearest Forms and Publications Supply Point.

6-2. TUNING PROCEDURE.

Although it is possible for one man to accomplish the tuning procedure by himself, this is not recommended. One man should operate the antenna tuner unit and another the transmitter and remote control unit. The units are provided with receptacles for use of standard Navy sound powered phones during the tuneup steps.

Step 1. On the remote control (C-2372/SRT) set the **DUMMY LOAD-ANTENNA** control to **DUMMY LOAD** and **CHANNEL SELECTOR** to desired channel.

Step 2. Tune transmitter on desired frequency into the 50-ohm dummy load, noting the PA plate current and antenna current readings.

- a. When tuning at frequencies from 2 to 6 mc it is necessary to use channels 1 or 2 only. Channels 3 and 4 tune frequencies from 6 to 15 mc.

WARNING

Do not operate Antenna Tuning
Group AN/SRA-20 above the
100-watt level.

- Step 3. After the transmitter has been tuned, set DUMMY LOAD-ANTENNA control to ANTENNA.
- Step 4. On the TUNER RF TN-329/SRT set CHANNEL SELECTOR (control (A)) to the desired channel. This should be the same as the channel previously selected at the remote control panel.
- Step 5. Set CHANNEL SELECTOR (control (C)) to desired channel. If channel 3 or 4 is to be used, set control (C) to OPER position.
- Step 6. Rotate the AUTOTRANSFORMER (control (B)) SLOWLY in a counterclockwise direction until it stops. Note the dial reading and rotate the control 16 turns clockwise. This allows the sliding roller contact to rest on the 50-ohm point of the autotransformer.

CAUTION

When using controls (B) , (D) , (E) , or (F) ; approach both maximum and minimum of the autotransformer and all loading coils SLOWLY to avoid any damage to the sliding roller contacts as they hit against the stops.

- Step 7. Rotate control (D) , (E) , or (F) (depending on the channel in use) counterclockwise SLOWLY until it stops. This positions the sliding roller contact to the minimum inductance point on the coil in use. At this time it is necessary to establish two-way communications between personnel located at the transmitter and the antenna tuner unit. The antenna tuner and the remote control unit have provisions for sound powered telephones.
- Step 8. Key the transmitter using control (G) and tune control (D) , (E) , or (F) (whichever is being used) for minimum indication on the SWR REFLECTED POWER meter. If the PA plate current and the antenna current readings do not coincide with those of step 2, alternately tune controls (B) and (D) , (E) or (F) for minimum indication on the SWR REFLECTED POWER meter until the readings are equal to those of step 2. When this condition exists, the antenna is matched to the

transmitter and the tuning operation is complete for one channel. Channel 4 should always be selected for the highest of the frequencies to be used. Channel 4 employs either 6 or 10 $\mu\mu\text{fd}$ of capacitance in series with the antenna to allow easier tuning of the higher frequencies. This capacitance is selected by CHANNEL 4 CAPACITANCE control (H). Tuning of channel 4 should be started with control (H) in the 10 $\mu\mu\text{f}$ position. Perform steps 1 through 8. If this procedure produces no dip on the SWR REFLECTED POWER meter, turn control (H) to 6 $\mu\mu\text{f}$ and repeat step 8. The position of control (H) will depend on the location of the antenna and its relationship to nearby structure and other antennas.

NOTE

A rise in PA plate current accompanied by a decrease in reflected power current indicates tuning in the correct direction. If reflected power current increases, reverse direction of tuning.

- Step 9. Repeat steps 1 through 8 for the other 3 channels.
- Step 10. Unkey transmitter using control (G).
- Step 11. Place controls (A) and (C) in OPER position.
- Step 12. Remove sound powered phones.
- Step 13. Close watertight cover securely.

Any of the four channels may now be selected remotely at the remote control unit on transmitter.

NOTE

When it becomes necessary to change an antenna tuner frequency after all 4 channels have been initially set up, it is imperative that the operator does not disturb the setting of any channel except the channel being changed. If, by error, the settings are disturbed, it will be necessary to reset the channel in question.

PHOTO WITH CALLOUTS
FOR
TUNER, RF TN-329/SRT

Figure 6-1

PHOTO WITH CALLOUTS
FOR
CONTROL, TUNER C-2372/SRT

Figure 6-2

6-3. REMOVAL, ADJUSTMENT, REPAIR AND REASSEMBLY OF PARTS AND SUB-ASSEMBLIES.

With the possible exceptions of the removal of the front panel and the base plate of TUNER, RF TN-329/SRT, the simplicity of the mechanical construction of Antenna Tuning Group AN/SRA-20 makes normal repair and replacement of parts or sub-assemblies quite obvious.

a. REMOVAL OF CHASSIS OF TUNER, RF-329/SRT

1. Remove four screws located in the center of the rear of the water-tight case. These are located on either side of J-101 and J-102.
2. Remove four screws located in the extreme corners of the front panel.
3. Grasp the two handles on the front panel and slide the tuner chassis straight out of its case.

b. REMOVAL OF FRONT PANEL OF TUNER, RF-329/SRT

Refer to Figure 6-3

1. Remove two handles by removing securing screws.
2. Remove six 6-32 screws from front panel.
3. Remove three pointer knobs by loosening two Allen head set screws.
4. Remove four Duodial knobs by loosening set screws.

NOTE

These steps release the front panel to provide clearance for replacement of parts and/or repair. Extreme care should be exercised so as not to rupture the wiring or place excessive strain on the cable harness.

NOTE

The dial reading on the four Duodial is relative only; therefore, no exact alignment or registration is required or necessary.

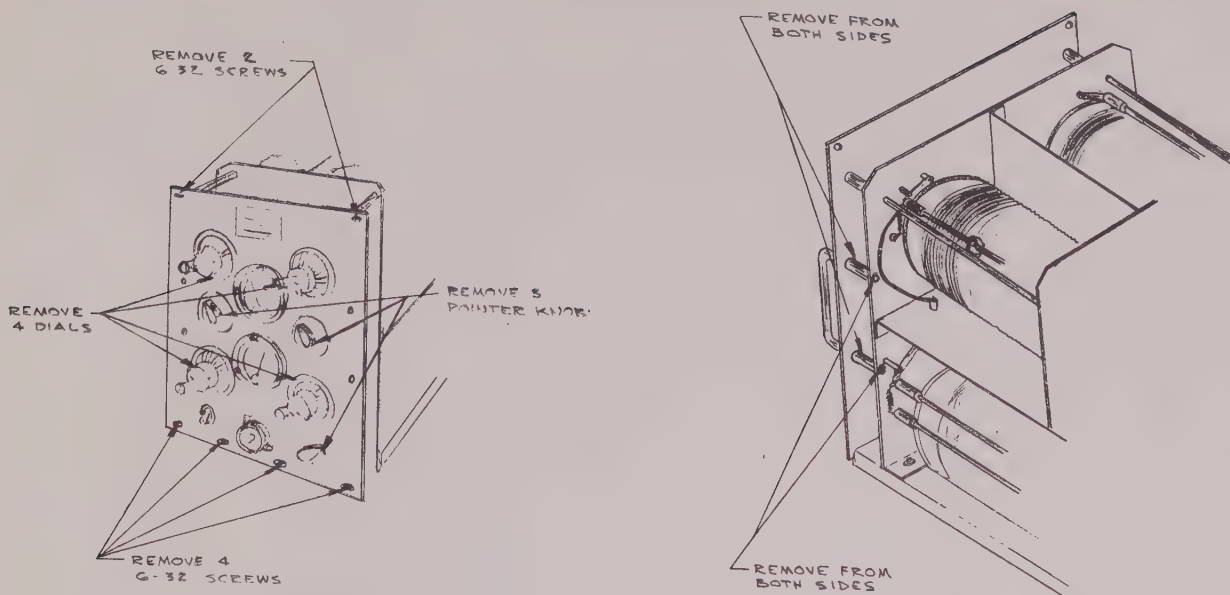


Figure 6-3. Antenna Tuner, (TN-329/SRT), Front Panel Removal

c. REMOVAL OF BASE PLATE.

Refer to Figure 6-4.

1. Remove the four 6-32 screws which are located along the front panel.
2. Remove wireway by removing the three 6-32 screws marked ↑ .
3. Remove the base plate from the tuner structure by removing eight 6-32 screws, nuts and washers marked ➡ .

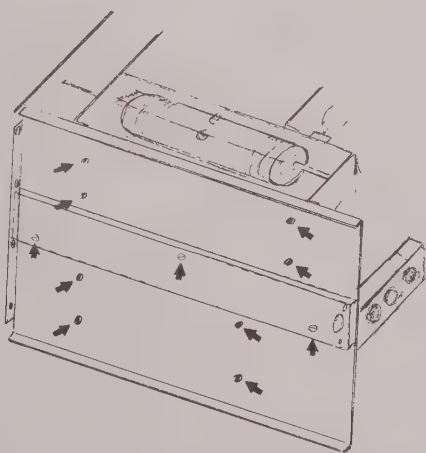


Figure 6-4. Antenna Tuner, (TN-329/SRT), Base Plate Removal

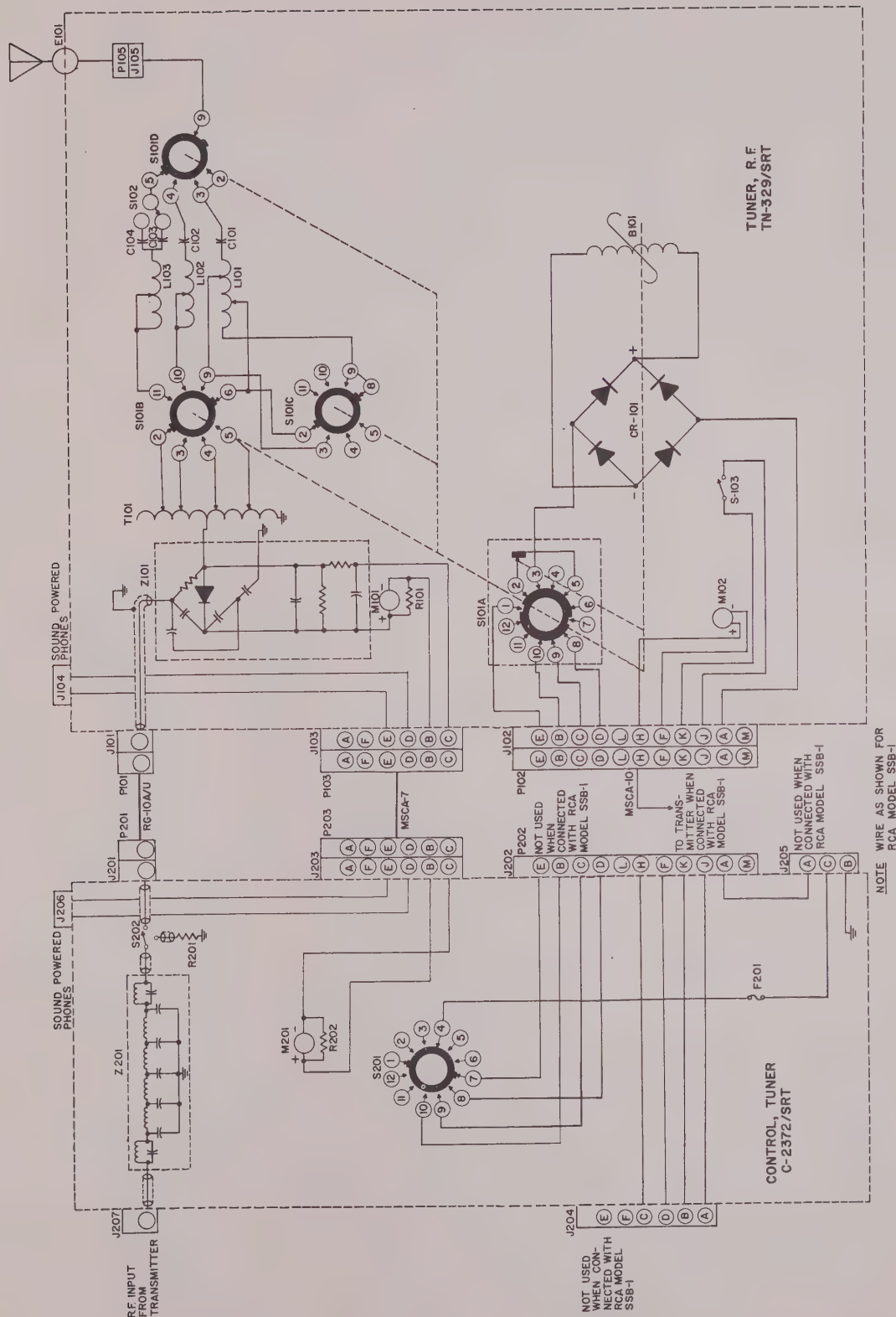


Figure 6-5a. Antenna Tuning Group AN/SRA-20, Schematic Diagram of Major Units
When Used with SSB-1 Transmitter

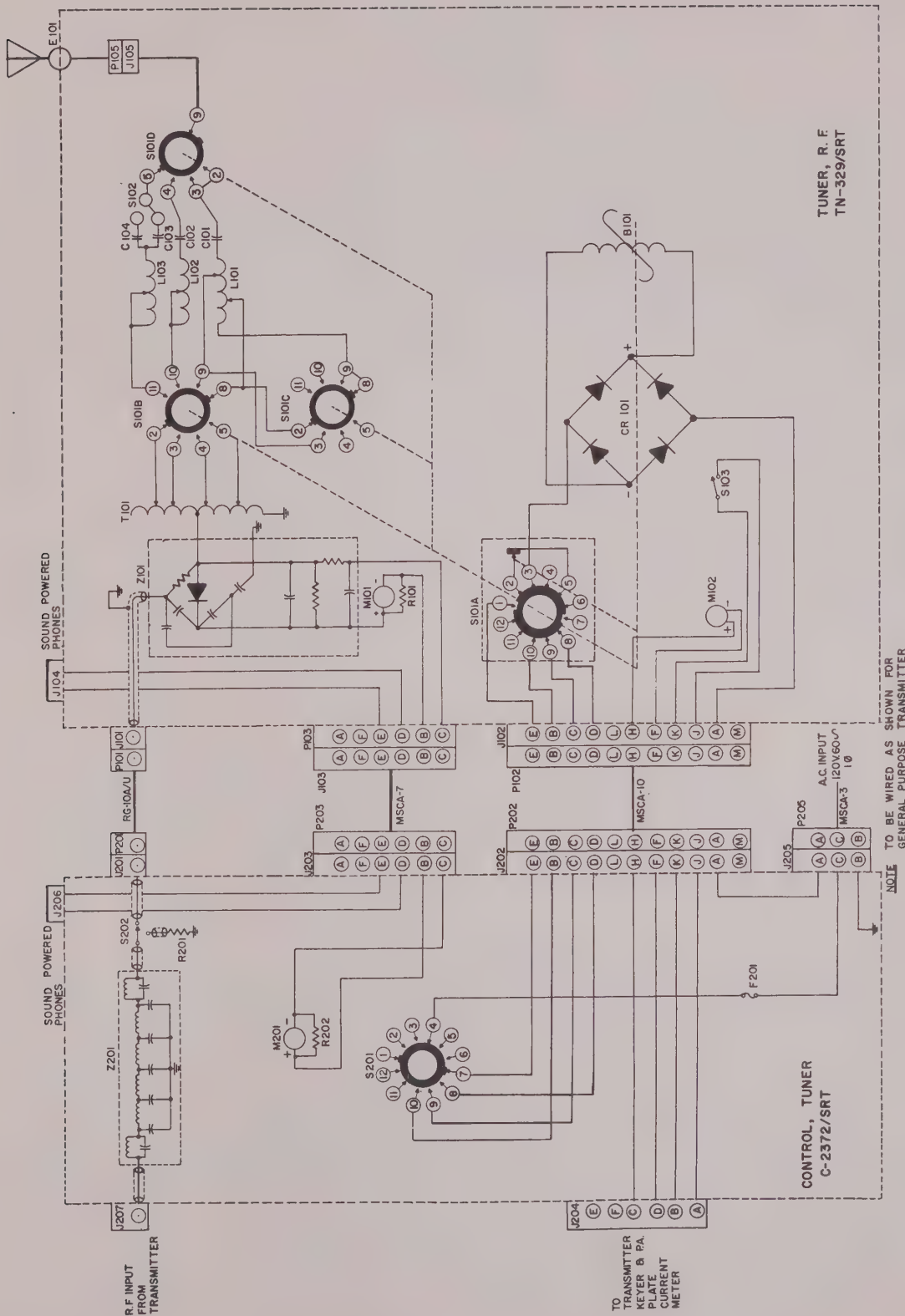


Figure 6-5b. Antenna Tuning Group AN/SRA-20, Schematic Diagram of Major Units
When Used with Utility Transmitter

SECTION 7

PARTS LIST

7-1. INTRODUCTION.

Reference designations (previously referred to as circuit symbol, reference symbol, etc.) have been assigned to identify all maintenance parts of the equipment. They are used for identifying parts in the equipment (marked adjacent to the part they identify) and are included on drawings, diagrams and the parts list. The letters of a reference designation indicate the kind of part, such as, resistor, capacitor, rectifier, etc. The number differentiates between parts of the same general group. Parts of the first major unit normally are numbered from 101 to 199; parts of the second 201 to 299, etc.

7-2. MAINTENANCE PARTS LIST.

Table 7-1 lists all major units and their maintenance parts. Column 1 lists the reference series of each major unit followed by the reference designations of the various parts in alphabetical and numerical order. Column 2 refers to the explanatory notes that appear in paragraph 7-6 below. Column 3 gives the name and describes the various parts. Complete information is given for all key parts (parts differing from any part previously listed in this table). The name and description are omitted for other parts. However, reference is made to the key part for the data. Column 4 indicates how the part is used and gives its functional location in the stock equipment.

7-3. STOCK NUMBER IDENTIFICATION.

Table 7-2 is arranged by key designation. The "Stock Number" column gives stock numbers for the various key parts. Therefore, if you have the reference designation for a key part, find its key designation from 7-1 before using this table. Stock numbers preceded by an asterisk (*), if any, apply to replacement item which differs from the items initially supplied in the equipment.

7-4. STOCK NUMBER CROSS REFERENCE.

Table 7-3 lists by stock numbers all key parts that have been assigned stock numbers. If you know the stock number of a part used in this equipment this table will enable you to locate the part's description in table 7-1.

7-5. LIST OF MANUFACTURERS.

Table 7-4 lists manufacturers of parts used in the equipment. The prefix letters are those assigned by the Bureau of Ships to identify the manufacturers, on identification plates (name plates), and on small parts.

7-6. NOTES.

The following provides additional information about items listed in Table 7-1:

1. Fabricate locally from bulk material.
2. Manufacture in a Navy shop.
3. Will be procured on demand by the nearest Naval Shore Supply Activity.
4. Non-replaceable in this application. Listed for reference only.
5. Replace by adapting or modifying the standard item having the stock number listed in Table 7-3.
6. For replacement use FSN part listed in Table 7-3.
7. Low failure item - if required, requisition from ESO, referencing NAVSHIPS 900,180A.
8. Assemble components parts.

TABLE 7-1. ANTENNA TUNING GROUP AN/SRA-20 MAINTENANCE
PARTS LIST

TUNER, R.F. TN-329/SRT

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
A-101		Pivot Arm, Assy; IEEI Dwg. No. D-2401-1, IEEI Part No. 101-15	Roller contact arm Autotrans.
A-102		Pivot Arm Assy; IEEI Dwg. No. D-2401-2, IEEI Part No. 101-16	Roller contact arm Autotrans.
A-103		Pivot Arm, Assy; IEEI Dwg. No. D-2401-3, IEEI Part No. 101-17	Roller contact arm Autotrans.
A-104		Pivot Arm, Assy; IEEI Dwg. No. C-2401-4, IEEI Part No. 101-18	Roller contact arm Autotrans.
A-105		Pivot Arm, Assy; IEEI Dwg. No. C-2402-1, IEEI Part No. 101-19	Roller contact arm ldg. coil no. 1
A-106		Pivot Arm, Assy; IEEI Dwg. No. C-2402-2, IEEI Part No. 101-20	Roller contact arm ldg. coil no. 1
A-107		Pivot Arm, Assy; IEEI Dwg. No. C-2403, IEEI Part No. 101-21	Roller contact arm coil no. 2
A-108		Same as A-107	Roller contact arm coil no. 3
A-109		Cover, front, outer case; IEEI Dwg. No. D-2423, IEEI Part No. 101-26	Cover for TN-329/ SRT Tuner
A-110		Outer case assy, IEEI Dwg. No. D-2425, IEEI Part No. 101-27	Case for TN-329/ SRT Tuner
A-111		Outer Case; IEEI Dwg. No. C-2409, IEEI Part No. 101-23	Outer case for TN-329/SRT Tuner
A-112		Antenna Lead-In Assy, IEEI Dwg. No. B-2442, IEEI Part No. 101-30	Back, outer case TN-329/SRT Tuner
B-101		Solenoid, Rotary, G.H. Leland, Inc. No. C-80655, IEEI Part No. 101-32-12	Channel changing control
C-101		Capacitor, 125 MMFD 20 KV, Vacuum, Jennings Radio Mfg. Corp., Type W; IEEI Part No. 101-32-5	Antenna Loading
C-102		Capacitor, 15 MMFD 20 KV, Vacuum, Jennings Radio Mfg. Corp. Type W; IEEI Part No. 101-32-4	Antenna Loading

TABLE 7-1. ANTENNA TUNING GROUP AN/SRA-20 MAINTENANCE
PARTS LIST

TUNER, RF TN-329/SRT

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING
C-103		Capacitor, 10 MMFD 20 KV, Vacuum; Jennings Mfg. Corp. Type W; IEEI Part No. 101-32-3	Antenna Loading
C-104		Capacitor, 6 MMFD 20 KV, Vacuum, Jennings Mfg. Corp., Type W; IEEI Part No. 101-32-2	Antenna Loading
CR-101		Rectifier, Selenium, full wave bridge, G.H. Leland, Inc. No. B-6162B; IEEI Part No. 101-32-11	Power source for rotary solenoid
E-101		Insulator, Bowl, Gen. Ceramics No. 1101-00; IEEI Part No. 101-30-2	Antenna lead-in assy
E-102		Same as E-101	Antenna lead-in assy
E-103		Insulator, Phenolic, IEEI Part No. 100-24-1.0 x .718 x .064	Coil contact mounting
E-104		Same as E-103	Coil contact mounting
E-105		Same As E-103	Coil contact mounting
E-106		Same as E-103	Coil contact mounting
E-107		Insulator, 3/8" dia. x 11/16" lg., Phenolic; IEEI Part No. 100-36	Spring contact coil No. 2 & No. 3
E-108		Contact, spring, Fansteel Metal Corp. Dwg. No. SK-1600; IEEI Part No. 101-14-9	Coil contacts front and back, all coils
E-109		Same as E-108	Same as E-108
E-110		Same as E-108	Same as E-108
E-111		Same as E-108	Same as E-108
E-112		Same as E-108	Coil contacts front and back, cell coils
E-113		Same As E-108	Same as E-112
E-114		Same as E-108	Same as E-112
E-115		Same as E-108	Same as E-112

TABLE 7-1. ANTENNA TUNING GROUP AN/SRA-20 MAINTENANCE
PARTS LIST

TUNER, R.F. TN-329/SRT

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING
E-116		Insulator, Phenolic, Grade C, Type FBM; IEEI No. 100-59	Top Insulator Vacuum Cap. Bank
E-117		Insulator, Phenolic, Grade C, Type FBM; IEEI No. 100-60	Bottom Insulator Vacuum Cap. Bank
E-118		Insulator, Phenolic, Grade C, Type FBM; IEEI Part No. 100-61	Ant. plug support
E-119		Insulator, Phenolic, Grade C, Type FBM; IEEI Part No. 100-63	Vacuum cap. support
E-120		Insulator, Phenolic, 3/8" dia x 15/16 lg., IEEI No. 100-37	Spring contact coil No. 2 and no. 3
E-121		Same as E-120	Spring contact mount- ing coil, no. 2 & 3
E-122		Hood, UG-177/U, Amphenol Electronic Part No. 83-765; IEEI Part No. 101-31-6	Hood for UG-58A/U connectors
E-123		Dial-Duo, with dial lock, Helipot Corp. No. R-40L, IEEI Part No. 101-25-1	Tuning controls
E-124		Same as E-123	
E-125		Same as E-123	
E-126		Same as E-123	
E-127		Knob, Pointer, Raytheon No. 90-4-2G, IEEI Part No. 101-31-4	Control knobs, fr. panels
E-128		Same as E-127	Same as E-127
E-129		Same as E-127	Same as E-127
H-101		Pivot Shaft; IEEI Part No. 100-25 (.187 dia. x .437 overall length)	Coil roller contact arm pivot
H-102		Same as H-101	Same as H-101
H-103		Same as H-101	Same as H-101
H-104		Same as H-101	Same as H-101
H-105		Same as H-101	Same as H-101

PARTS
LISTS

SECTION 7

TABLE 7-1. ANTENNA TUNING GROUP AN/SRA-20 MAINTENANCE
PARTS LIST

TUNER, R.F. TN-329/SRT

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING
H-106		Same as H-101	Same as H-101
H-107		Same as H-101	Same as H-101
H-108		Same as H-101	Same as H-101
H-109		Same as H-101	Same as H-101
H-110		Same as H-101	Same as H-101
H-111		Pivot Shaft; IEEI Part No. 100-26 (.187 dia. x .687 overall length)	Same as H-101
H-112		Same as H-111	Same as H-101
H-113		Pivot Shaft; IEEI Part No. 100-27 (.187 dia. x .843 overall length)	Same as H-101
H-114		Pivot Shaft; IEEI Part No. 100-28 (.187 dia. x .874 overall length)	Same as H-101
H-115		Pivot Shaft; IEEI Part No. 100-29 (.187 dia. x .999 overall length)	Same as H-101
H-116		Pivot Shaft; IEEI Part No. 100-30 (.187 dia. x 1.249 overall length)	Same as H-101
H-117		Shaft, Channel selector; .250 dia. x 3-13/64 long alum. rod; IEEI Part No. 100-33	Channel selector control arm
H-118		Same as H-117	Same as H-117
H-119		Spacer, Alum. rod. .363 dia. x .375 lg. IEEI Part No. 100-49	Shaft spacers for coils no. 2&3 rear shaft spacers for coil no. 1 and Autotrans.
H-120		Same as H-119	Same as H-119
H-121		Same as H-119	Same as H-119
H-122		Same as H-119	Same as H-119
H-123		Same as H-119	Same as H-119
H-124		Same as H-119	Same as H-119

TABLE 7-1. ANTENNA TUNING GROUP AN/SRA-20 MAINTENANCE
PARTS LIST

TUNER, RF TN-329/SRT

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
H-125		Spacer; Alum. Alloy, .375 x 1.813 long; IEEI Part No. 100-62	Antenna plug support spacer
H-126		Same as H-125	Same as H-125
H-127		Spacer; Alum. Rod .375 dia. x 2.500 lg. IEEI Part No. 100-41	Front panel support spacer
H-128		Same as H-127	Same as H-127
H-129		Standoff, Ground; Alum. rod .250 dia. x 1.250 lg; IEEI Part No. 100-42	Gr. standoff auto-transformer gr. contact
H-130		Spacer, Alum. rod. .250 dia. x 7 5/8 lg., IEEI Part No. 100-46	Back to middle panel support
H-131		Same as H-130	Same as H-130
H-132		Spacer, Alum. Rod .363 x 125 lg., IEEI Part No. 100-47	Shaft spacer for 1dg. coil no. 1 (fnt)
H-133		Spacer, Alum. rod .363 dia. x .250 lg., IEEI Part No. 100-48	Fnt shaft spacer auto transformer
H-134		Caps, grid, mounting, H.H. Smith, Inc. No. 1451; IEEI Part No. 101-32-6	Vacuum cap. mounting caps
H-135		Same as H-134	Same as H-134
H-136		Same as H-134	Same as H-134
H-137		Same as H-134	Same as H-134
H-138		Same as H-134	Same as H-134
H-139		Same as H-134	Same as H-134
H-140		Same as H-134	Same as H-134
H-141		Same as H-134	Same as H-134
H-142		Shaft, brass, 3/8-16 x 5 7/16" long, IEEI Part No. B-2442-1; IEEI Part No. 101-30-1	Antenna lead-in

TABLE 7-1. ANTENNA TUNING GROUP AN/SRA-20 MAINTENANCE
PARTS LIST

TUNER, R.F. TN-329/SRT

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
L-101		Coil, assy; IEEI Dwg. No. D-2399-1, IEEI Part No. 101-12	Ldg. coil no. 1
L-102		Coil, assy; IEEI Dwg. No. D-2399-2, IEEI Part No. 101-13	Loading coil no. 2
L-103		Same as L-102	Loading coil no. 3
M-101		Meter, 1 ma. D.C. Phaotron Instr. and Elec. Co. No. MR-26 W001DCMAR, IEEI Part No. 101-25-3	SWR reflected power indicated
M-102		Meter, 300 ma. D.C. Phaotron Instr. and Elec. Co. MR-26 W300 DCMAR, IEEI Part No. 101-25-4	Plate current
MP-101		Stop pin; IEEI Part No. 100-32 (.187 dia. x 1.343 overall length)	Coil position locator
MP-102		Same as MP-101	Same as MP-101
MP-103		Chain, rivited, endless; Diamond Chain Co. Inc. No. 89 (32 links); IEEI Part No. 101-05-1	Channel selector drive shaft chains
MP-104		Same as MP-103	Same as MP-103
MP-105		Gear, Diamond Chain Co., Inc. NO. 89-13B, 1/4" bore. IEEI Part No. 101-05-2	Channel selector drive shafts (top gear)
MP-106		Same as MP-105	Same as MP-105
MP-107		Gear, Diamond Chain Co., Inc. No. 89-13B, 11/16" bore, IEEI Part No. 101-05-3	Channel selector drive shafts (bottom gear)
MP-108		Same as MP-107	Same as MP-107
MP-109		Coupler, shaft, Gen. Cement No. 6701, IEEI Part No. 101-32-8	Shaft extension for S-102
O-101		Grommet, Gen. Cement Part No. 1042-m; IEEI Part No. 101-04-8; AN931-4-7	Partition wire run thru's

TABLE 7-1. ANTENNA TUNING GROUP AN/SRA-20 MAINTENANCE
PARTS LIST

TUNER, R.F. TN-329/SRT

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
O-102		Same as O-101	Same as O-101
O-103		Same as O-101	Same as O-101
O-104		Same as O-101	Same as O-101
O-105		Panel Bushing, brass si-pl, .253 I.D. x 3/8-32 NEF-CL-20, 5/16 lg. H.H. Smith, Inc. No. 1192-AX; IEEI Part No. 101-04-11	Bearings for coil and switch shafts
O-106		Same as O-105	Same as O-105
O-107		Same as O-105	Same as O-105
O-108		Same as O-105	Same as O-105
O-109		Same as O-105	Same as O-105
O-110		Same as O-105	Same as O-105
O-111		Same as O-105	Same as O-105
O-112		Same as O-105	Same as O-105
O-113		Same as O-105	Same as O-105
O-114		Same as O-105	Same as O-105
O-115		Gasket, gusset, 6 1/4 x 2 x 1/8, IEEI Part No. 100-64	Rear receptacle mount gasket
O-116		Spring, compression, .175 dia. I.D. x 7/8" lg. music wire-zinc plated, Gardner Wire Co. No. 4C20C; IEEI Part No. 101-05-4	Cam stop pin compression
O-117		Same as O-116	Same as O-116
O-118		Clamp, cable, water-tight, Amphenol No. 9767-18-10; IEEI Part No. 101-31-25	Watertight clamp for control cable
O-119		Clamp, cable, water-tight, Amphenol No. 9767-22-12; IEEI Part No. 100-22	Same as O-118
O-120		Handle, Cambridge Thermionic Corp. No. 2385-2, IEEI Part No. 101-25-2	Pull handle, front panel
O-121		Same as O-120	Same as O-120

TABLE 7-1. ANTENNA TUNING GROUP AN/SRA-20 MAINTENANCE
PARTS LIST

TUNER, R.F.. TN-329/SRT

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING
O-122		Grommet, rubber, Gen. Cement Part No. 5716, IEEI Part No. 101-32-9	Cable harness passage
O-123		Same as O-122	Same as O-122
O-124		Spring, expansion, plain end, zinc plated, Gardner Wire Co. No. 8E25C, IEEI Part No. 101-32-26	Coil, roller arm spring
O-125		Same as O-124	Same as O-124
O-126		Same as O-124	Same as O-124
O-127		Same as O-124	Same as O-124
O-128		Same as O-124	Same as O-124
O-129		Same as O-124	Same as O-124
O-130		Same as O-124	Same as O-124
O-131		Same as O-124	Same as O-124
O-132		Gasket, 3/8 I.D. x 7/8 O.D. IEEI Dwg. No. B-2442-4; IEEI Part No. 101-30-4	Antenna lead-in assy
O-133		Same as O-132	Same as O-132
O-134		Gasket, 1 7/8 I.D. x 2 1/2 O.D., IEEI dwg. no. 2442-5; IEEI Part No. 101-30-5	Antenna lead-in assy
O-135		Same as O-134	Same as O-134
P-101		Connector, plug, electrical, UG-21D/U Amphenol Electronics No. 82-202, IEEI Part No. 100-23	Plug for UG-58A/U
P-102		Connector, plug, electrical, Amphenol Electronics No. AN3106A-20-33P; IEEI Part No. 100-21	Mating plug AN3102A-18-33S
P-103		Connector, plug, electrical, Amphenol Electronics No. AN3106A-18-12P; IEEI Part No. 101-31-23	Mating plug for AN3102A-18-12S

TABLE 7-1. ANTENNA TUNING GROUP AN/SRA-20 MAINTENANCE
PARTS LIST

TUNER, R.F. TN-329/SRT

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING
P-105		Plug, giant, banana, Birback No. 397; IEEI Part No. 101-30-3	Antenna lead-in assy
R-101		Resistor, 12 ohm 2 watt 5% IEEI Part No. 101-25-10	SWR reflected power meter shunt
S-101A		Wafer, switch, rotary, G.H. Leland, Inc. No. CDS-941; IEEI Part No. 101-32-12A	Master control wafer switch
S-101B		Wafer, switch, rotary ceramic; G.H. Leland Inc. No. W-3610; IEEI Part No. 101-32-12B	Channel selector (autotrans.)
S-101C		Wafer, switch. Same as S-101B	Channel selector
S-101D		Wafer, switch, rotary, ceramic; G.H. Leland Inc. No. W-3611; IEEI Part No. 101-32-12C	Same as S-101C
S-102		Switch, rotary, ceramic, Central Lab No. PA2001; IEEI Part No. 101-04-10	Ant. load cap. selector
S-103		Switch, toggle, SPST, J-B-T Instruments Inc. No. ST-42A, IEEI Part No. 101-25-5	Transmitter key on-off switch
S-104		Cam, switch, loading coil No. 1, aluminum 1.5 dia. x 1.312 lg. IEEI Part No. 100-34	Channel switch loading coil no. 1
S-105		Cam, switch, auto-transformer, alum. 1.5 dia. x 1.702; IEEI Part No. 100-77	Autotrans. channel switch
T-101		Transformer, auto. IEEI Dwg. No. D-2399-3, IEEI Part No. 101-14	Matching transformer
W-101		Wire harness, 1-lth 32 1/2" RG-58A/U 2-lth 30 " No. 18 wire 2-lth 26 1/2" No. 18 wire 2-lth 24" No. 18 wire 2-lth 26" No. 18 wire IEEI Dwg. No. C-2404, IEEI Part No. 101-22	I nter-connecting cable (internal)
Z-101		Component ring assy, IEEI Dwg. No. C-2411 IEEI Part No. 101-24	SWR Reflected power indicator

TABLE 7-1. ANTENNA TUNING GROUP AN/SRA-20 MAINTENANCE
PARTS LIST

CONTROL, TUNER C-2372/SRT

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING
A-201		Enclosure, Control Unit, C-2372/SRT; IEEI Dwg. No. D-2426, IEEI Part No. 100-98A	Control Tuner C-2372/SRT
E-201		Hood, UG-177/U, Amphenol Electronics Part No. 83-765; IEEI Part No. 101-31-6	Hood for UG-58/U connectors
E-202		Same as E-201	Same as E-201
E-203		Knob, Pointer, Raytheon No. 90-4-2G, IEEI Part No. 101-31-4	Control knobs, front panel
E-204		Same as E-203	Same as E-203
E-205		Insulator, Phenolic, Grade C, Type FBM, 1/2 x 3/4 dia., IEEI Part No. 100-66	Dummy load clip mount
E-206		Insulator, Phenolic, Grade C, Type FBM, 1/2 x 3/4 x 2 1/2, IEEI Part No. 100-67	Dummy load clip mount
F-201		Fuse, 3 Amp. 250V, Fusetron Type AGX; IEEI Part No. 101-31-20	Power fuse in C-2372/SRT
H-201		Clip, locking, Atlas E.E. Corp. No. 18-16 ALN, IEEI Part No. 101-31-26	Antenna lead-in assy
H-202		Same as H-201	Same as H-201
M-201		Meter, 1 ma. D.C. Phaostron Instr. and Elec. Co. No. MR-26 W001DCMAR, IEEI Part No. 101-25-3	SWR reflected power indicated
O-201		Clamp, cable, watertight, Amphenol No. 9767-18-10; IEEI Part No. 101-31-25	Watertight clamp for control cable
O-202		Same as O-201	Same as O-201
O-203		Clamp, cable, water-tight, Amphenol No. 9767-12; IEEI Part No. 100-22	Same as O-201
O-204		Same as O-203	Same as O-201
O-205		Clamp, cable, watertight, Amphenol No. 9767-16-8; IEEI Part No. 101-31-31	Watertight clamp for P-205

TABLE 7-1. ANTENNA TUNING GROUP AN/SRA-20 MAINTENANCE
PARTS LIST

CONTROL, TUNER C-2372/SRT

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
P-201		Connector, plug, electrical, UG-21D/U Amphenol Electronics Part No. 82-202, IEEI Part No. 100-23	Plug for UG-58A/U
P-202		Connector, plug, electrical, Amphenol Elec. No. AN3106A-20-33P; IEEI Part No. 100-21	Mating plug for AN3102-A-18-33S
P-203		Connector, plug, electrical, Amphenol Elec- tronics No. AN3106A-18-12P; IEEI Part No. 101-31-23	Mating plug for AN3102-A-18-12S
P-204		Same as P-203	Same as P-203
P-205		Connector, receptacle, plug, electrical AN3106A-16-10P; IEEI Part No. 101-31-22	Power input to control unit
P-207		Same as P-201	Plug for UG-58A/U
R-201		Resistor, 50 ohm 120 watt, Sprague Elec. Co. Style SIF; IEEI Part No. 101-31-1	Ant. dummy load
S-201		Switch, master control, rotary, wafer, G.H. Leland, Inc. No. B-64219, IEEI Part No. 101-31-3	Master control switch, control unit
S-202		Switch, coaxial, B & W, Model 551-B, using UG-625/U connectors, IEEI Part No. 101-31-2	Transmission line switching
W-201		Cable, coax, RG-58A/U, approx. 12" long with UG-88B/U, IEEI Part No. 101-3127	RF input panel connector to freq. pres. network
W-202		Cable, coax, RG-58/U, approx. 9" long with UG-88B/U on each end, IEEI Part No. 101-3128	Output of freq. pres. network to coaxial switch
W-203		Cable, coax. RG-58/U approx. 14" long, one end connected to UG-88B/U IEEI Part No. 101-31-29	Coax switch to dummy load
W-204		Cable, coax, RG-58/U, approx. 8" long with RG-88B/U on one end. IEEI Part No. 101-31-30	Coax switch to RF output
X-201		Fuse holder, panel mounted, Fusetron type HJM, IEEI Part No. 101-31-19	C-2372/SRT
Z-201		Freq. pres. network, type NP-101C-1, IEEI Dwg. No. C-2437, IEEI Part No. 101-29	Harmonic filter

